

complications still exist although the field is gradually being reduced. Fortunately the efficacy of conservative measures is becoming better appreciated.

Statistics are useful but anyone who has approached obstetric problems from this point of view realises its limitations. Nowhere is this so evident as in the Tropics. Many of the patients who come with obstetric complications such as placenta previa, eclampsia or contracted pelvis also suffer from anaemia, malaria or nutritional deficiency diseases which have their own adverse effects on the prognosis of the case. A writer on Clinical Obstetrics in the Tropics cannot but lay emphasis on tropical diseases complicating pregnancy and parturition. Unfortunately to date this subject has not received the attention it deserves and only of late has there been any proper consideration of the problem. I have stressed this subject so that the practitioner in the Tropics may better understand these complications as they occur in pregnancy and the methods of dealing with them. Much work yet remains to be done in this field.

In describing obstetric operations I have tried to indicate their limitations. It should be remembered that nature frequently plays the role better than any obstetrician. When however the need for interference does arise meticulous care is required at every step of the operation and it is my hope that the technical details given in this section will be of value.

It is a pleasure to acknowledge the invaluable assistance given by my junior colleagues in the hospital—Drs R. K. K. Tampam, P. V. Venkataswami and M. K. Krishna Menon. Dr R. K. K. Tampam assisted me in the preparation of the greater part of the book before he left to undertake post graduate studies at Edinburgh. His presence there was most valuable as he saw the book through the press. Drs Venkataswami and Krishna Menon helped me during the preparation of the latter half of the work and with the revision of the proofs as they came from the press. I also acknowledge the assistance given by the steno typist Mr A. Ranganathan whose careful and accurate transcription of the work is beyond all praise. I thank Mr P. M. Ratnasabapathi the artist for his skill and patience in drawing the illustrations and Miss M. P. Russell M.A. who compiled the Index.

My thanks are specially due to Dr John Sturrock of Edinburgh who perused the manuscript and offered many valuable suggestions. To the publishers Messrs Oliver and Boyd I am indebted.

CONTENTS

SECTION I

ANATOMY AND PHYSIOLOGY

CHAP	PAGE
I THE PELVIS	1
II THE FEMALE ORGANS OF GENERATION	8
III PHYSIOLOGY OF THE FEMALE GENERATIVE ORGANS	17
IV MATURATION AND FERTILISATION OF THE OVUM	19

SECTION II

PHYSIOLOGY OF PREGNANCY

V MATERNAL CHANGES DUE TO PREGNANCY	27
VI THE SIGNS SYMPTOMS AND DIAGNOSIS OF PREGNANCY	39
VII DIAGNOSIS OF PREGNANCY—ASCHEIM ZONDER TEST AND RADIOLOGICAL DIAGNOSIS	52
VIII THE FŒTUS IN NORMAL PREGNANCY	69
IX ANTENATAL CARE	72

SECTION III

PHYSIOLOGY OF LABOUR

X CAUSATION AND STAGES OF LABOUR	85
XI THE MECHANISM OF LABOUR	94
XII CONDUCT OF NORMAL LABOUR	101

SECTION IV

PHYSIOLOGY OF THE PUERPERIUM

XIII THE PHENOMENA OF THE NORMAL PUERPERIUM	124
XIV THE CARE OF THE PUERPERIUM	128
XV CARE OF THE NEW BORN CHILD	135

SECTION I

PATHOLOGY OF PREGNANCY

	PAGE
XVI ^{CHAP} TOXÆMIAS OF PREGNANCY	151
XVII DISEASES COMPLICATING PREGNANCY—CARDIOVASCULAR DISEASES	193
XVIII DISEASES OF THE RESPIRATORY SYSTEM COMPLICATING PREGNANCY	206
XIX TROPICAL DISEASES	223
XX DISEASES OF THE BLOOD	238
XXI DISEASES AND ABNORMALITIES OF THE OVUM	274
XXII ABORTION	303
XXIII ECTOPIC PREGNANCY	319
XXIV HÆMORRHAGES IN THE THIRD TRIMESTER OF PREGNANCY AND FIRST TWO STAGES OF LABOUR	348
XXV PLACENTA PRÆVIA	361

SECTION II

PATHOLOGY OF LABOUR

✓XXVI DISTOCIA IN LABOUR	377
XXVII ABNORMAL CEPHALIC PRESENTATIONS	387
XXVIII PELVIC PRESENTATIONS	411
XXIX TRANSVERSE OR OBLIQUE LIE	434
XXX PRESENTATION AND PROLAPSE OF THE CORD	449
XXXI MULTIPLE PREGNANCY	458
XXXII DISTOCIA DUE TO ANOMALIES OF THE EXPULSIVE FORCES	468
XXXIII DISTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS	482
XXXIV DISTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	490
XXXV DISTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	510
XXXVI DISTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	521
XXXVII CONTRACTED PELVIS	530
XXXVIII COURSE OF PREGNANCY AND LABOUR IN CONTRACTED PELVIS	544
XXXIX MANAGEMENT OF LABOUR IN CONTRACTED PELVIS	548
XL SPECIAL FORMS OF CONTRACTED PELVIS	564
XLI COMPLICATIONS OF THE THIRD STAGE OF LABOUR	579
XLII INJURIES TO THE PARTURIENT CANAL	598
XLIII ASPHYXIA NEONATORUM	620
XLIV ACCIDENTS AND INJURIES TO THE CHILD	620

SECTION I II

OBSTETRIC OPERATIONS

CHAP	PAGE
XLV INTRODUCTION	640
XLVI FORCEPS	647
XLVII VERSION	672
XLVIII CÆSAREAN SECTION	695
XLIX ENLARGEMENT OF THE PELVIC CAVITY	723
L INDUCTION OF ABORTION AND LABOUR	730

SECTION I III

PATHOLOGY OF THE PUERPERIUM

LI PUERPERAL INFECTION	742
------------------------	-----

APPENDICES

I TRANSFUSION	784
II ANÆSTHESIA AND ANALGESIA IN LABOUR	789
III POST NATAL CARE	795
IV ENDOCRINOLOGY IN OBSTETRICS	802
INDEX	807

SECTION I
ANATOMY AND PHYSIOLOGY

CHAPTER I
THE PELVIS

The pelvis is important from the obstetrical point of view inasmuch as it forms the canal through which the fetus has to pass. It may be divided into an upper part the pelvis major or false pelvis, and a lower part the pelvis minor or true pelvis by the *linea terminalis*, which is formed by the upper border of the first sacral vertebra the arcuate line of the ilium and the pectineal line of the pubis. The pelvis major or the upper part of the pelvis, is the expanded portion above this line while the true pelvis lies below and behind the *linea terminalis*. This is the

vulva below. There are three orifices, the urinary meatus, the genital outlet and the anus which pierce this diaphragm.

THE DIAMETERS OF THE PELVIS

The measurements of the bony pelvis are important, inasmuch as they furnish the obstetrician with the dimensions of the somewhat rigid bony canal through which the foetus has to pass. The actual diameters in the living specimen will however, be less, owing to the fact that the bony surfaces are covered with soft parts and muscles which diminish to a certain extent the measurements as obtained in the skeleton.

The external measurements which are usually taken are —

(1) The *interspinous diameter*, which is the distance between the outer lips of the antero superior iliac spines measuring about $10\frac{1}{2}$ ins (26 cm)

(2) The *intercristal diameter*, which is the distance between the outer lips of the iliac crests at the widest part, measuring about $11\frac{1}{2}$ ins (29 cm)

(3) The *external conjugate* or *diameter of Baudelocque* is the distance between the depression just below the spinous process of the last lumbar vertebra and the most prominent point on the antero superior surface of the symphysis pubis in the mid line—about 8 ins (20 cm)

(4) The *inter trochanteric diameter* is the maximum width between the greater trochanters measuring $12\frac{1}{2}$ ins (31 cm)

These external measurements afford by no means a correct estimation of the size of the true pelvis but they help in the majority of cases to give a fairly definite idea of the size and the general configuration of the pelvis.

So far as the true pelvis is concerned the diameters are generally taken at different planes. The planes usually chosen for this purpose are —

- (1) The plane of the pelvic inlet
- (2) The plane of the pelvic outlet
- (3) The plane of the greatest pelvic dimensions in the cavity
- (4) The plane of the least pelvic dimensions in the cavity

The Pelvic Inlet The diameters of the pelvic inlet are of great obstetrical importance. The chief of these diameters is the *obstetrical conjugate*. This diameter represents the distance between the sacral promontory and the nearest point on the posterior surface of the symphysis pubis. It measures about 4 ins (10 cm)

The *anatomical conjugate* or *conjugate vera* (11 cm) is the distance between the sacral promontory and the upper portion of

the inner surface of the symphysis pubis while the *diagonal conjugate* is the distance from the promontory of the sacrum to

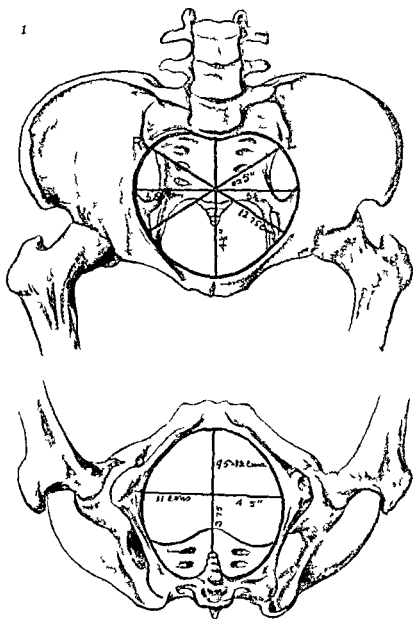


FIG. 1.—Diameters of the inlet and outlet of the female pelvis

the apex of the pubic arch. The diagonal conjugate is generally of great value in estimating the size of the true conjugate and this is done by subtracting about $\frac{3}{4}$ in (2 cm) from the diagonal

conjugate, thus allowing for the inclination thickness and height of the symphysis pubis

Other diameters that may be taken at the superior strait are —

(a) The *transverse diameter*, which represents the greatest width in this plane. It is the distance between the widest apart points on the linea terminalis and measures about $5\frac{1}{2}$ ins (13.5 cm) normally

(b) The *Oblique Diameters Right and Left*. They run from the sacro iliac joint of one side to the iliopectineal eminence of the opposite side and they are termed right and left, or first and

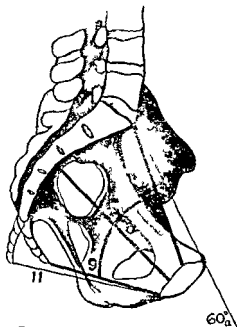


FIG. 2—Sagittal section of the bony pelvis showing the curve of Carus and the antero-posterior diameters at the inlet cavity and outlet

Note the changing position of the coccyx during labour

second—the former being from the right sacro iliac joint and the latter from the left. These measure about 5 ins (12.75 cm)

The Plane of the Outlet Here two diameters are taken—the antero-posterior and the transverse

The *antero-posterior diameter* extends from the apex of the pubic arch to the tip of the coccyx. The coccyx however, being movable permits of an increase in the diameter of nearly one inch (2 to 2.5 cm) so that the length of the diameter increases from $3\frac{3}{4}$ to $4\frac{3}{4}$ ins (9.5 to 12 cm) when the coccyx is displaced backwards

The *transverse diameter* is the distance between the inner surfaces of the ischial tuberosities and measures about 4½ ins (11 cm)

In the cavity there are several planes but the chief planes which may be reckoned with for purposes of obstetrical consideration are the planes of the greatest and least pelvic dimensions.

The *plane of the greatest pelvic dimensions* passes through the junction of the second and third sacral vertebrae and laterally through the ischial bones over the middle of the acetabulum. It is nearly circular and its antero-posterior diameter measures 5 ins (12.5 cm) while its transverse diameter measures $5\frac{1}{4}$ ins (12.75 cm).

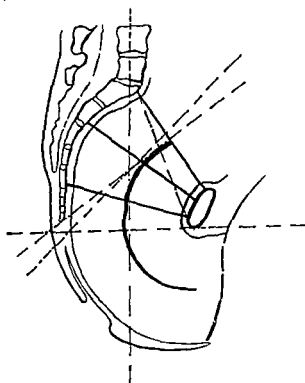


FIG. 3.—Sagittal section of the pelvis showing the planes with the axes at different levels.

The *plane of the least pelvic dimensions* extends through the lower margin of the symphysis pubis, the tip of the sacrum and the ischial spines. The antero-posterior diameter measures about $4\frac{1}{4}$ ins (11.5 cm) while the transverse diameter measures about 4 ins (10.5 cm).

Although these measurements represent the average measurements in the majority of European and American women, it must be said that so far as women in Southern India are concerned the measurements are generally about $\frac{3}{4}$ to 1 in (2 to 2.5 cm) shorter in all the diameters. This is an important point to bear in mind as otherwise the impression may be difficult to eradicate that the

measurements taken represent a contracted type of pelvis when as a matter of fact it is normal for the particular locality. It need hardly be emphasised that pelvic measurements may vary within a limited extent from country to country and it is just as well that the averages are taken and borne in mind for particular countries.

THE JOINTS OF THE PELVIS

The sacro iliac joint is a synovial joint between the auricular surfaces of the sacrum and the ilium. In the adult male a large

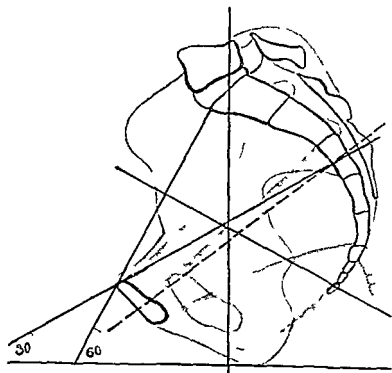


FIG. 4.—Sagittal section of the pelvis showing the inclination of the pelvis.

number of short but strong bundles of fibres enter into the constitution of the sacro iliac ligaments and as a result only a small amount of antero posterior rotatory movement is possible. In the female after puberty the range is much greater and it is increased temporarily in the later months of pregnancy.

The Pubic Symphysis The pubic bones are united to each other by a superior and an inferior pubic ligament and by an interpubic disc of fibro cartilage.

During pregnancy the pelvic joints and ligaments are relaxed and therefore more mobile. When the foetus is being expelled the

force is applied to the front of the sacrum. Upward dislocation is prevented by the interlocking mechanism of the middle segment of the sacrum. As the foetal head passes the anterior segment the antero posterior diameter of the pelvic inlet is slightly enlarged, and when the head reaches low the posterior part of the sacrum is pressed upwards against the resistance of its wedge, the movement being rendered possible only by the laxity of the joints and the stretching of the sacro tuberos and sacro spinous ligaments.

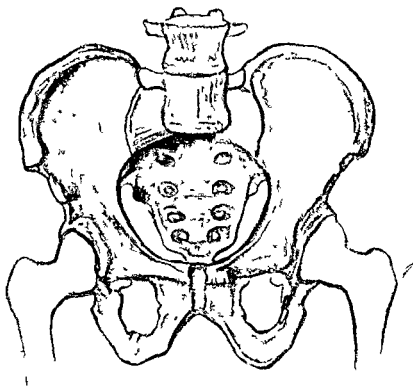


FIG. 5.—Configuration of the male pelvis

These characteristic features of the pelvic joints, particularly during pregnancy, are taken advantage of in obstetrics by making the woman in labour adopt particular positions to facilitate the delivery of the head. The two common positions adopted for increasing the diameters of the pelvis are Walcher's position and the exaggerated lithotomy position.

In Walcher's position the woman is so placed that her buttocks rest on the edge of the table and her legs hang down without any support. In this position there is an increase in the size of the conjugate vera by $\frac{1}{2}$ to 1 in., which may be sufficient to permit the engagement of the presenting part.

In the exaggerated lithotomy position the thighs are sharply flexed over the body and under these circumstances the antero-posterior diameter of the outlet is increased by $\frac{1}{2}$ to 1 in (1 to 2.5 cm) whereas in Walcher's position this diameter is shortened.

DIFFERENCE BETWEEN MALE AND FEMALE PELVIS

The following points of difference may be noted between a male pelvis and a female pelvis. The pelvic bones are stronger, thicker and rougher in the male than they are in the female. The chief difference is to be observed in the cavity. The male pelvis is far more angular and inclined to be funnel-shaped and it is less delicately curved. The female pelvis on the other hand is broader and its cavity rounder. The iliac fossae are shallower in the female, the muscular impressions are generally more marked in the male than in the female. On the whole it may be said that the male pelvis as compared with that of the female is smaller, deeper, steeper and funnel-shaped. In the female the ischial spines as well as the tuberosities are more widely separated. The curves in the sacrum, both lateral and vertical, are more marked in the female than in the male, the bone being shorter and its direction downward and backward. The pelvic inlet is rounder in the female and the diameters are generally greater than in the male, especially the transverse diameter. The outlet in the female is much larger on account of the recession of the lower end of the sacrum and the coccyx and the greater distance between the ischial tuberosities. The pubic arch in the male is more acute, while in the female it is more rounded.

CHAPTER II

THE FEMALE ORGANS OF GENERATION

The External Genital Organs

THE external generative organs consist of the mons veneris, the labia majora and minora, the clitoris, the vestibule, the hymen and vaginal orifice, the external urethral meatus and the perineum. All these structures are generally included in the term vulva.

The *mons veneris* is the pad of fat lying in front of the pubis and in the adult female the skin over it is covered by a growth of hair.

The *labia majora* are the two elongated folds of skin projecting downwards and backwards from the mons veneris. They meet in front in the anterior commissure and posteriorly in the posterior commissure in front of the anus.

The *labia minora* are exposed only when the *labia majora* are separated. They are two thin folds of skin one on each side just within the *labia majora*. The lower portions of the *labia minora* fuse across the middle line to form a fold known as the *fourchette* which is usually lacerated during child birth. Between the *fourchette* and the vaginal orifice is a boat like depression the *fossa navicularis*.



FIG. 6—External genitalia

- | | | |
|----------------|-------------------------|---------------------|
| 1 Prepuce | 5 Vestibule | 9 Fossa navicularis |
| 2 Clitoris | 6 Urethra | 10 Fourchette |
| 3 Labium majus | 7 Anterior vaginal wall | 11 Anus |
| 4 Labium minus | 8 Vagina | |

The *clitoris* is situated in the most anterior portion of the vulva and projects between the *labia minora*. This corresponds to the penis in the male.

The *vestibule* is the triangular surface which extends from the clitoris above to the anterior margin of the hymen below and laterally to the *labia minora*. At the centre of the vestibule is the opening of the urethra. The vestibule is generally concealed by the *labia* in the natural condition.

The Hymen This is an incomplete septum of mucous membrane which closes the vaginal orifice. In the virgin the aperture in it is usually a small longitudinal slit running from behind forwards. The membrane may vary in shape but is usually circular or somewhat crescentic. The hymen is usually ruptured at the consummation of marriage and is therefore considered one of the signs of virginity when it is intact. This is not however absolutely certain evidence of virginity. At child birth the hymen is extensively lacerated and is later represented by a large number of cicatrised nodules of varying sizes called the *caruncule myrtiformes*.

The *perineum* is the wedge shaped area between the lower end of the posterior wall of the vagina and the anterior anal wall.

The *Bartholin's glands* are a pair of small globular structures situated one on either side of the vaginal orifice and covered by the posterior end of the bulb of the vestibule. They are compound racemose glands and lead into a narrow duct which opens below the hymen on the inner surface of the labium minus near its posterior end.

The Internal Genital Organs

These are the vagina, uterus, Fallopian tubes and the ovaries.

THE VAGINA

This is a tube extending from the vulva outside to the uterus and is situated between the bladder in front and the rectum behind. It is directed upwards and backwards and is slightly curved posteriorly. The vaginal canal is a transverse or H shaped slit with the lower end somewhat narrower than the upper end. The cervix dips into the vaginal canal and the vault of the vagina which surrounds the cervix consists of four pouches or fornices: the anterior fornix in close relation with the bladder; the posterior fornix which is a *cul-de-sac* in relation with the pouch of Douglas and the rectum; and the right and left fornices which are in close relation with the ureter and uterine artery of the side.

Anteriorly the vagina is in relation with the bladder and the urethra. A septum intervenes which contains a considerable amount of musculo-fascial tissue. Laterally, the vagina is supported by the free edges of the Levatores ani muscles. Posteriorly in its upper third the vagina is related to the pouch of Douglas and is therefore in close contact with the peritoneal cavity, being separated from it only by a thin septum formed by the vaginal wall and the peritoneum. The lower portion of the vagina is in relation with the rectum and perineal body.

The vagina is lined by stratified squamous epithelium.

THE UTERUS

The uterus is a hollow organ situated in the pelvis between the bladder in front and the rectum behind. It is pear shaped in the unimpregnated condition and is partially covered by peritoneum and lined by a mucous membrane, the endometrium. It consists of two unequal parts: the corpus or body and the neck or cervix. The Fallopian tubes come off from either side of the uterus at the junction of the superior and lateral margins. The portion of the uterus above the level of the insertions of the Fallopian tubes is known as the fundus of the uterus. It is convex or dome shaped.

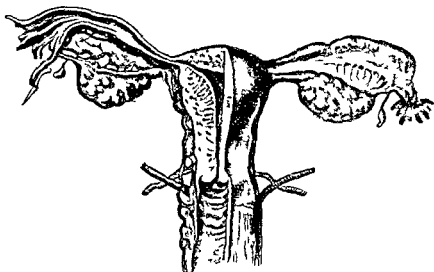


FIG. 7.—The uterus and its appendages (posterior view)

Section of the left half shows the cavity of the uterus and lumen of the Fallopian tube

and is directly continuous with the rest of the body. The cavity of the uterus is triangular in shape with the base upwards and the apex situated at the junction of the body with the cervix. In the non-gravid condition the length of the cavity is about $1\frac{1}{2}$ to 2 ins. The endometrium, or the lining membrane, is composed of a cellular stroma of embryonic cells in which lie simple tubular glands and is covered by a columnar ciliated epithelium.

THE CERVIX UTERI

This is the portion of the uterus which lies below the isthmus and the internal os. It is divided into two parts: the supravaginal and the infravaginal portions. The supravaginal portion is covered on its posterior surface by peritoneum but on the anterior and

lateral surfaces it is in contact with extraperitoneal connective tissue. The lining membrane is covered by columnar epithelium and contains compound racemose glands. In the non-gravid condition the length of the cervical canal is about one inch from the internal to the external os. The external os is nearly circular in nulliparous women but after delivery the orifice may become a transverse slit. In some cases even in nullipara the orifice is transverse.

LIGAMENTS OF THE UTERUS

Certain ligaments keep the uterus in position. These are the broad ligaments, the round ligaments, the utero-sacral ligaments and Mackenrodt's ligaments or the ligamenta transversalia colli.

The *broad ligament* on each side is a double layer of peritoneum directed from the lateral margin of the uterus to the lateral wall of the pelvis. It serves to divide the pelvic cavity into an anterior and a posterior compartment. The two layers of peritoneum which form the broad ligament enclose extraperitoneal connective tissue, the Fallopian tube, the round ligament and true ligament of the ovary, the par oophoron and the ep oophoron and certain blood vessels, nerves and lymphatics.

The *round ligaments* extend on either side from the antero-lateral angle of the uterus just below and in front of the insertion of the Fallopian tubes. They are enclosed between the serous layers of the broad ligaments and pass laterally through the internal abdominal inguinal rings into the inguinal canals and finally merge in the labia majora.

The *utero-sacral ligaments* are two condensations of visceral pelvic fascia extending from the posterior and upper portion of the cervix to the fascia covering the second and third sacral vertebrae.

The *ligamenta transversalia colli* or *Mackenrodt's ligaments* also spoken of as the *cardinal ligaments* are thickened bands of fibro-muscular tissue stretching across the pelvis. They run in the base of the broad ligaments being attached medially to the side of the cervix uteri and vaginal vault and laterally to the side wall of the pelvis.

PERITONEAL RELATIONS

The pelvic peritoneum is a continuation of the peritoneal investment of the anterior wall of the abdomen. As seen in a mesial sagittal section it will be found that the peritoneal investment as it comes along the posterior aspect of the anterior abdominal wall behind the symphysis pubis arches over the fundus of the bladder and a portion of the posterior surface and is then reflected over the upper two thirds of the anterior surface.

of the body of the uterus covers the fundus of the uterus, and passes along the whole of the posterior surface of the body of the uterus and is thereafter continued downwards over the posterior surface of the supravaginal portion of the cervix and the upper third of the posterior vaginal wall. From there it is carried on to the anterior rectal wall and in its lower part covers only the anterior wall of the rectum, whilst higher up it covers the lateral wall also, and at the level of the promontory it passes on to the peritoneum of the posterior abdominal parietes. As the peritoneum

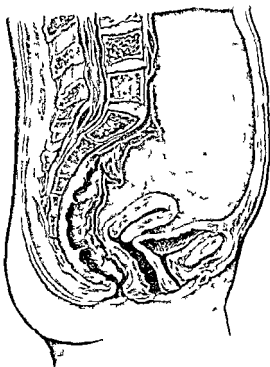


FIG. 8.—Sagittal section of female pelvis with the peritoneal relations

is reflected on either side of the uterus it is prolonged laterally in a fan shaped manner forming the broad ligament on either side. The pouch formed by the reflection of the peritoneum from the posterior surface of the bladder on to the anterior surface of the body of the uterus is known as the utero vesical pouch whilst the pouch of Douglas, which is much deeper is formed by the reflection of the peritoneum which covers the posterior wall of the uterus and the supravaginal portion of the cervix to the anterior rectal wall. The utero sacral ligaments posteriorly divide this pouch into three compartments a mesial deeper fossa which is properly spoken of as the pouch of Douglas and two lateral shallow fossae the para rectal fossae.

THE FALLOPIAN TUBES

Lying in the medial four fifths of the upper border of the broad ligament the Fallopian or uterine tubes are situated one on either side of the uterus. They are attached to the uterine cornu and measure in length about 4 to 4½ ins. They are convoluted and their free ends are near the ovaries.

The Fallopian tube may be divided into four portions—the interstitial isthmal ampullary and infundibular portions. The interstitial portion is that part of the tube which is included within the muscular wall of the uterus. The isthmus is the narrowest portion immediately adjacent to the uterus. The ampulla is the widest part of the tube and ends in a fimbriated end which is the outermost end of the tube and is known as the infundibulum. This opens directly into the peritoneal cavity by an ostium which is surrounded by a number of radiating fimbriae.

The wall of the tube consists of two layers of muscle—the inner circular and the outer longitudinal. Externally is the peritoneum of the broad ligament. The lumen of the tube is lined by mucous membrane which is thrown into folds called plicae consisting of a fibrous tissue core lined by a single layer of ciliated epithelium.

THE OVARIES

These are two almond shaped bodies which are situated at the outer extremity of the Fallopian tube and attached to the posterior surface of the broad ligament by the mesovarium.

The ovarian ligament extends from the upper end of the lateral wall of the uterus just below and behind the insertion of the Fallopian tube to the inner or uterine pole of the ovary.

The ovary is divided into three regions—the hilum the medulla and the cortex. The hilum is the small area composed of connective tissue and unstriated muscle fibres through which the ovarian vessels lymphatics and nerves pass into the ovary from the broad ligament. The cortex of the ovary is the outer layer where the Graafian follicles are situated. Its surface is lined by a single layer of cells called the germinal epithelium continuous at the hilum with the peritoneum of the broad ligament. The ovary has no peritoneal covering. The medullary portion is the central portion of the ovary composed of connective tissue and a large number of blood vessels.

BLOOD VESSELS LYMPHATICS AND NERVES

Blood Vessels The pelvic organs in the female are supplied by the ovarian uterine and vaginal arteries. The vulva is supplied by the internal pudic artery. The ovarian artery is a branch of

the abdominal aorta. It runs along the upper part of the broad ligament to the uterine cornu, where it anastomoses with the terminal branch of the uterine artery. It supplies the ovary and the Fallopian tube.

The uterine artery arises from the anterior branch of the internal iliac artery. It runs downwards, forwards and medially in the base of the broad ligament, crosses above the ureter and passes to the side of the uterus. Just before the main branch turns abruptly upwards a small branch is given off, the cervico vaginal artery, which supplies the lower portion of the cervix and the

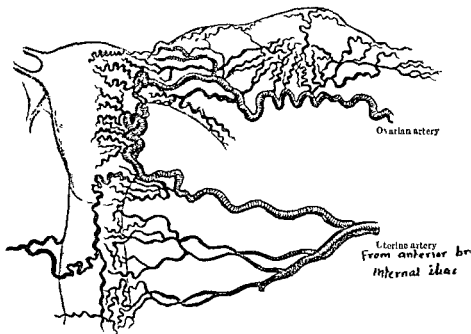


FIG. 9.—Blood supply of the internal genitalia

upper portion of the vagina. The main artery, which proceeds upwards in the broad ligament along the lateral border of the uterus, gives off many branches, and finally sends a branch to anastomose with the ovarian artery, while a second one passes in the meso salpinx supplying the Fallopian tube, and a third goes to the fundus.

The veins which emerge from the uterine fundus, Fallopian tube and ovary form the pampiniform plexus. From this two ovarian veins emerge, which later fuse to form the single ovarian vein, which on the left side joins the renal vein and on the right side the inferior vena cava. The uterine veins accompany the uterine artery and end in the corresponding internal iliac vein.

The vaginal artery springs from the anterior division of the internal iliac artery below the uterine artery. It supplies the vagina while some twigs anastomose with the uterine artery. The vaginal veins form a plexus round the vagina and empty into the internal iliac vein.

The internal pudic artery supplies the vulva and the perineum and the accompanying veins pass into the inferior hæmorrhoidal and inferior vesical plexus.

The Lymphatics. There are a large number of chains of glands which receive the lymphatics from various portions of the female generative tract. These glands are grouped as the aortic glands, the common iliac glands, the external iliac glands, the internal iliac glands, the inguinal glands and the sacral glands. The aortic glands drain the lymphatics from the ovary, Fallopian tube and the body of the uterus. They also drain the lymphatics coming from the iliac glands. The common iliac glands, which are situated along the common iliac artery on either side, receive the lymphatic vessels from the external and internal iliac glands and directly from the viscera. Lymphatics from this chain pass to the aortic glands. The external iliac glands are related to the external iliac vessel and are situated in three chains—the outer, middle and inner. They receive the lymphatics from the femoral gland, the inguinal glands, the clitoris, the bladder, the upper part of the vagina and the cervix uteri. From the external iliac glands lymphatics pass on to the common iliac gland. The internal iliac glands are in relationship with the internal iliac artery and receive the lymph from the lower portion of the rectum, the bladder, cervix and upper part of the vagina. From these, lymphatics pass to the common iliac glands. The inguinal glands drain the lymphatics from the perineum, anus, vulva and the lower part of the vagina. A few lymphatic vessels from the fundus of the uterus, which accompany the round ligaments, also drain into this set of glands. From here the lymphatics pass on to the external iliac glands. The sacral glands lie in front of the sacrum on the inner side of the second and third sacral foramina and from them lymphatics pass on to the common iliac glands.

The Nerves. The nerve supply for the internal genital organs is derived principally from the sympathetic nervous system but partly also from the para-sympathetic. Both the sympathetic and para-sympathetic nerves contain motor and sensory fibres.

CHAPTER III

PHYSIOLOGY OF THE FEMALE GENERATIVE ORGANS

THE organs of generation do not mature till the second decade of life and after a certain period which varies with different individuals some of the functions cease. The essential organ of reproduction in the female is the ovary as here are produced the ova. The accessory organs include the oviducts or Fallopian tubes the uterus in which the fertilised ovum is retained during the period of pregnancy and where it develops and the vagina which is the passage through which the spermatozoa are enabled to pass upwards. The mammary glands which undergo a special development during pregnancy may also be considered as accessory organs. They serve for the nourishment of the infant during the initial period of its extra uterine life.

MENSTRUATION AND OVULATION

There are two processes which occur regularly in women generally between the ages of fifteen and forty five to fifty these are ovulation and menstruation.

Menstruation is the periodic flow of blood and mucus from the uterus which begins at a particular age and persists for thirty to thirty five years. The age at which menstruation begins varies with individuals and in different countries. The average age in European countries is about fourteen to fifteen years while in tropical countries and in the East generally, it occurs one or two years earlier varying between the ages of eleven and fourteen.

In the majority of women there is a definite periodicity of the flow which generally occurs once in about twenty-eight days. The duration of the flow is from three to five days, and the amount of blood lost varies with individuals the average being 4 to 8 oz. Menstruation is suspended during pregnancy and lactation.

Before the first menstruation other signs of puberty that is of approaching sexual maturity, are usually observed. These include rapid growth with changes in the skeleton leading to the typically feminine type of pelvis the development of the mammary glands and the growth of hair on the pubes. At the same time the mental characteristics typical of the sex manifest themselves.

During the menstrual period there are often disturbances of the other functions of the body and a general disinclination for exertion.

Ovulation The ovaries are responsible not only for the production of the ova but also for certain hormones or internal secretions which have got a bearing on the physiology of the

individual At birth the ovary consists of a stroma of spindle shaped cells and is covered by a layer of cubical epithelium—the germinal epithelium Embedded in the stroma and especially just underneath the epithelium are a large number of primordial follicles About 70,000 follicles are to be found in the ovary of the new born child and during the woman's life some 500 of these mature and become ripe the remainder are destroyed

The primordial follicles develop into fully formed Graafian follicles This maturation of the follicles first occurs with the onset of puberty At one point in the mass of cells surrounding the ovum a cavity appears filled with fluid—the liquor folliculi With increasing size of the Graafian follicle the cortical stroma covering it becomes progressively thinner and more vascular and the ovum moves to a position in the follicle adjacent to the outer surface of the ovary At certain periods or under certain conditions the follicle ruptures and the liquor folliculi with the ovum is discharged into the peritoneal cavity The ovum thus set free is directed into the open end of the Fallopian tube by the current set up by the cilia with which the epithelium is furnished There may be other directive forces besides this for when the ovary on one side is removed and the Fallopian tube on the other side is closed pregnancy although less likely to occur is far from infrequent After the discharge of the ovum the remaining portions of the follicle undergo a characteristic series of changes which result in the production of the *corpus luteum* Immediately after the rupture the cells of the *membrana granulosa* rapidly increase in size a few of them undergoing mitotic division so that a dense mass of cells is formed nearly filling the original follicle The *corpus luteum* attains its greatest size in the human species about the nineteenth day of the menstrual cycle at which stage it has a purplish colour It then gradually undergoes regressive changes If however the ovum which has been discharged undergoes fertilisation and pregnancy results the *corpus luteum* continues to grow for a considerable time and attains its largest size at about the third month though it does not disappear until after the end of pregnancy Occasionally the more fully developed *corpus luteum* of pregnancy is often spoken of as the true *corpus luteum* and is distinguished from the spurious *corpus luteum* of menstruation or of ovulation without fertilisation There is however no essential difference other than that of size between these two kinds of *corpora lutea* It is probable that in the human female ovulation occurs as a rule alternately in each of the two ovaries once every four weeks during the thirty or thirty five years of sexual life

The Relation of Ovulation to Menstruation There is no doubt that menstruation normally depends on the functional activity of the ovary Its onset coincides with the first production

of ripe ova in the ovary, and it ceases with the cessation of ovulation at the climacteric or menopause. In cases where the ovaries have been removed before puberty menstruation does not occur. Removal of both ovaries during adult life generally brings about a premature menopause.

It seems probable that the ripening and discharge of the ova in the human ovary occur about the thirteenth to the seventeenth day of the menstrual cycle, taking the first day of menstruation as the beginning of this cycle.

CHAPTER IV

MATURATION AND FERTILISATION OF THE OVUM

The spermatozoa, which are introduced into the female generative tract by the act of copulation, ultimately come in contact with and fertilise the ovum discharged from the ovary by the bursting of the Graafian follicle. Before the ovum can be fertilised it must undergo a process of maturation or ripening. This consists of a preliminary stage of growth, during which the ovum increases greatly in size. During this stage of growth, changes occur both in the nucleus and in the cytoplasm. The nuclear changes affect chiefly its chromatin content. The chromosomes unite with one another in pairs usually in their long axis, so that the number is reduced by half, each however representing a double chromosome. The process is termed conjugation of the chromosome. The number of chromosomes found in the nucleus is constant for all the cells in an animal of any given species and in man the number is probably forty-eight.

The changes in the cytoplasm, which mark the period of growth, result in a great increase in the size of the cell.

Having passed through this period of growth further changes occur in the ovum near its upper pole. The double chromosomes arrange themselves in an equatorial plane with reference to the modified spindle which is placed radially. The chromosomes divide, one half of them pass centrally while the other half pass outwards, forming a projection at the upper pole of the ovum, which becomes separated off to form the *first polar body*.

The division of the cytoplasm, unlike the division of the nucleus, is unequal, so that the polar body carries with it only a small part of the cytoplasmic content of the ovum. There is a further division of the cell in a like manner and a *second polar body* is formed and cast off. The ovum has now become mature, the characteristics of which are that the number of chromosomes are reduced by one half and that the size is greater.

Fertilisation Fertilisation consists in the union of a spermatozoon with a mature ovum. This generally takes place in the Fallopian tube. In the human subject fertility is probably highest about fourteen to eighteen days after the commencement of menstruation and lowest about a week before its onset. A spermatozoon pierces the zona pellucida and enters the mature ovum, the point of entry being closed at once to prevent the admission of other spermatozoa. At the same time the spermatozoon sheds its tail, while its head and body become altered to form the male pro nucleus. The two pro nuclei fuse with each other and give rise to the segmentation nucleus. This step is the essential feature of fertilisation. The nucleus so formed now possesses the number of chromosomes which is typical for the species, one half of them being derived from the ovum and one half from the spermatozoon.

With the arrival of the fertilised ovum in the uterus, extensive changes begin in this and in the neighbouring organs of generation. The walls of the uterus hypertrophy. There is a great growth of the blood vessels which have to supply not only the growing wall of the uterus but also the nutritional needs of the developing foetus through a special organ—the placenta.

After fertilisation the ovum undergoes a series of cell divisions, which follow one another in close succession, until a small sphere of cells is formed. This is called the *morula*, and the stage is called the *morula stage* or the *mulberry stage*. The process of differentiation now commences in the cells of the morula. Its outermost layer constitutes the trophoblast and cells in its interior differentiate into a closely packed inner cell mass and a loosely arranged primary mesoderm. The cells of the trophoblast differentiate further into an inner cellular layer, which is termed the cytotrophoblast or Langhans' layer, and an outer syncytial layer termed the plasmodi trophoblast. The plasmodi trophoblast throws out a large number of irregular villous processes which exert a histolytic action on the uterine mucosa, and not only effect embedding of the ovum in the maternal tissues but also, a little later, provide the channels by means of which the developing embryo is enabled to draw nourishment from the maternal blood. While these changes are occurring in the trophoblast, the inner mass undergoes differentiation which results in the formation of two hollow vesicles. Of the two vesicles so formed, one remains in close contact with the trophoblast and constitutes the amnio-embryonic vesicle; the other is placed more centrally and is usually referred to as the yolk sac.

The Differentiation of the Embryonic Area The embryonic area shows no distinguishing features in its earlier stages. At first merely circular, its outline rapidly alters and becomes oval,

indicating the long axis of the body. In the middle of the embryonic area a slight depression appears which is known as the primitive streak, and on either side of it there is a slight elevation the primitive fold. The presence of the primitive streak indicates that rapid growth is occurring throughout its site. Shortly afterwards a second thickening occurs—the medullary plate—from which by far the greater part of the central nervous system is developed. The raised ridges constitute the neural folds and the groove which separates them is the neural groove. From this primitive node a rod like process of cells grows headwards in the median plane and separates the floor of the neural groove from the subjacent roof of the entodermal vesicle. This is termed the head process and it is the forerunner of the skeletal axis of the body. The head process becomes very intimately connected with the underlying entoderm and both the cells forming the floor of the canal of the head process and the entoderm cells in contact with them break down so that the canal communicates freely with the vesicle and at its caudal end a communication is established between the entodermal vesicle or arc-enteron and the amniotic cavity. This connection is termed the *neurenteric canal*. At a later stage the three layers in the human embryo develop contributing to the forming of systems and organs which show distinct functional differences. These three layers are the ectoderm, the entoderm and the mesoderm.

Further details regarding the development of the embryo can be found in any book on Embryology.

The Foetal Membranes and the Placenta The amnion is a membranous sac which surrounds and protects the embryo. A fluid termed *liquor amnii* appears within the amniotic cavity and increases steadily in amount so that the sac gradually expands and encroaches on the cavity of the extra embryonic coelom. This expansion continues until the extra embryonic coelom is obliterated entirely except for a small portion which is included within the umbilical cord. The liquor amnii increases in quantity up to the sixth or seventh month of pregnancy and then diminishes somewhat. *At the end of pregnancy it amounts to about two pints.* It contains less than 2 per cent of solids consisting of urea and other extractives, inorganic salts, a small amount of protein and frequently a trace of sugar.

The *liquor amnii* fulfils the following purposes —

- (1) It allows of the free movement of the foetus particularly during the latter half of pregnancy.
- (2) It diminishes the risks to the foetus of injury from without.
- (3) It is a source of nourishment to the foetus.
- (4) It helps to maintain the foetal temperature at a constant level.

- (5) It prevents the formation of adhesions with the amnion
- (6) During labour it helps to dilate the passages to wash out the vagina, and thus to keep the parts sterile both by its mechanical and bactericidal properties

The Umbilical Cord This is formed by an outer covering of amniotic ectoderm containing in its interior the vitello intestinal duct and the yolk sac or umbilical vesicle. The umbilical cord incorporates within itself the body stalk and its contained umbilical vessels (two arteries and one vein) and the allantois. It is spirally

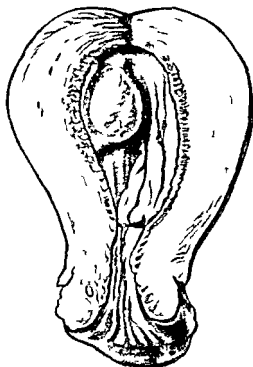


FIG. 10—Early embedding of the ovum (a section)

twisted and it increases in length, so that at the end of pregnancy it is about 50 cm. long.

The chorion consists of two layers—an outer of trophoblast, and an inner of primary mesenchyme. The trophoblast, as already stated, undergoes rapid proliferation and forms on the surface of the chorion numerous processes which are known as the primary chorionic villi. These increase in size and ramify, and the chorionic mesenchyme carrying branches of the umbilical vessels grows into them and in this way they are converted into secondary chorionic villi. With the growth of the embryo and the expansion of the amniotic cavity the decidua capsularis is thinned and compressed; the circulation through it is gradually cut off, and the villi of the

corresponding part of the chorion atrophy and disappear. This portion of the chorion becomes smooth and as it takes no share in the formation of the placenta is sometimes termed the non-placental part of the chorion. On the other hand the villi on that part of the chorion which is in contact with the decidua basalis increase greatly in size and complexity, and hence this part is named the chorion frondosum.

The Placenta This connects the fœtus to the uterine wall and is the organ by means of which the nutritive, respiratory and excretory functions of the fœtus are carried on.

THE PHYSIOLOGY OF THE FŒTUS

During the early period of its development the fertilised ovum is dependent for its nourishment on the remains of the cells of the discus proligerus adhering to it or on the fluid of the Fallopian tube into which it is immersed. From the second week onwards blood vessels traverse the chorionic villi and come into close relation with the maternal blood and from this period the whole growth of the fœtus is to be maintained by a special development of these connections in the placenta.

In the fully formed fœtus blood passes from the fœtus to the placenta by the umbilical arteries and is returned by the umbilical vein. There is no communication between fœtal and maternal circulations. The placenta represents the fœtal organ of respiration, nutrition and excretion. Thus the umbilical arteries carry to the placenta dark venous blood which in this organ loses its carbonic acid and takes up oxygen so that the blood of the umbilical vein is arterial in colour. The oxygen requirements of the fœtus are however very small. It is protected from all loss of heat, movements are sluggish and the only oxidative processes are those required for the building up of the developing tissues. On the other hand the fœtus has need of a rich supply of foodstuffs which it must obtain through the placental circulation.

THE FŒTAL CIRCULATION

The fœtal circulation differs from adult circulation in some material respects. The blood vessels traverse the umbilical cord and enter the umbilicus of the fœtus. Here the umbilical vein which carries oxygenated blood from the placenta passes directly into the liver but before doing so it gives off a branch—the ductus venosus—which carries the greater part of the blood directly into the inferior vena cava and thence to the right auricle. Here the blood stream impinges on the Eustachian valve and is directed through the foramen ovale into the left auricle whence it passes

the umbilicus and thence winding spirally around the umbilical vein as the umbilical arteries in the cord, they reach the placenta. Here they split up into arterioles and capillaries in the villi. The

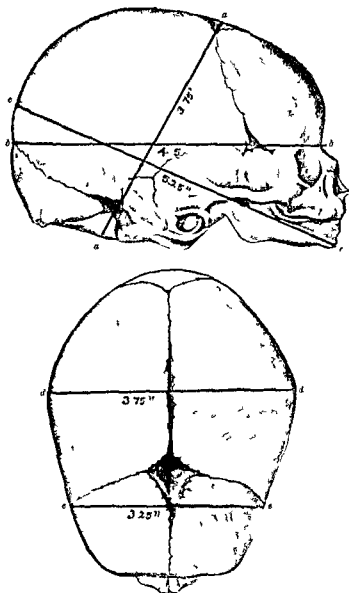


FIG. 13.—Diameters of the foetal skull

aa Suboccipitobregmatic
bb Occipito frontal

cc Suboccipitotemporal
dd Biparietal

ee Bitemporal

foetal blood contained in the placenta is thus constantly undergoing changes that in the adult occur in the lungs, the liver the blood forming and other organs

into the left ventricle, to be driven into the aorta. As this arterial blood passes into the inferior vena cava through the ductus venosus, it is of course mixed with the venous blood returning from the lower limbs and the lower part of the trunk. The aorta gives off the three main branches—the Innominate, left Common Carotid and left Subclavian—for the supply of the head and neck and superior extremities, and then descends as the Thoracic Aorta, passing eventually into the abdominal cavity as the Abdominal

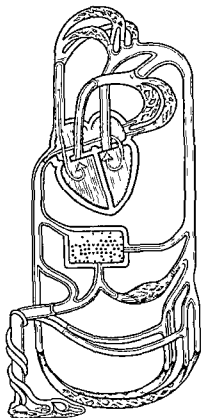


FIG 11—Schematic representation of the fetal circulation

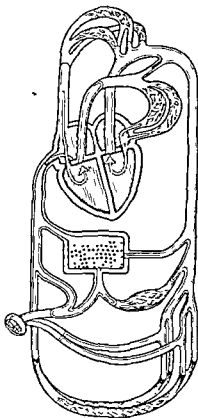


FIG 12—Schematic representation of the changes in circulation after birth of the child

Aorta The venous blood from the head and neck and superior extremities is returned to the right auricle by the superior vena cava, thence to the right ventricle, by which it is driven into the pulmonary artery. Only a small part of the blood passes through the lungs, the greater part traversing through a channel, the Ductus Arteriosus, which communicates with the aortic arch. The aorta divides into the common iliacs which further divide into the internal and external iliacs; and from the internal iliacs the hypogastric arteries leave, ascending alongside of the bladder to

the umbilicus and thence winding spirally around the umbilical vein as the umbilical arteries in the cord, they reach the placenta. Here they split up into arterioles and capillaries in the villi. The

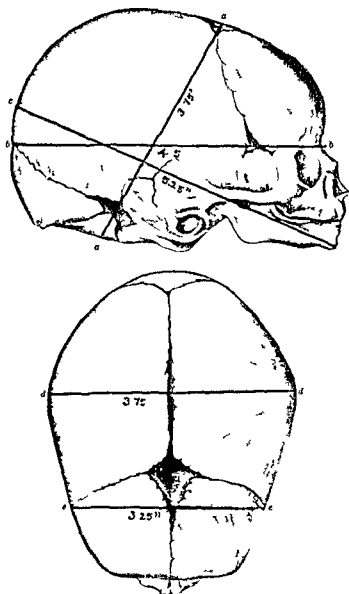


FIG. 13.—Diameters of the fetal skull

aa Subcephalic to regmat c

bb Occipito-frontal

cc Subprae-occipital

dd Parietal

ee Bi-temporal

fetal blood contained in the placenta is thus constantly undergoing changes that in the adult occur in the lungs the liver the blood forming and other organs

CHANGES AFTER BIRTH

After the birth of the child, when the first inspiration is taken, all the mechanical conditions of the circulation are modified. The resistance to the blood flow through the lungs is diminished, and the blood passes from the pulmonary arteries through the lungs into the left auricle. The pressure in the left auricle is raised, while in the right auricle it falls, so that the foramen ovale is closed and kept so. The increased rush of blood from the right ventricle through the pulmonary artery, consequent upon the suction action of the circulatory system in the lungs, makes it impossible for any blood to go through the ductus arteriosus, which therefore collapses, becomes obliterated and shrinks up. Consequent on the ligature applied on the umbilical cord, the supply of the blood from the vein is cut off, the walls of the umbilical vein agglutinate, and the vein is obliterated, remaining as a cord like ligament passing to the liver—the ligamentum teres. The ductus venosus also collapses and shrinks and becomes a vestigial structure. The hypogastric arteries contract and thrombose and form the obliterated hypogastrics of the adult. Hence the changes that take place in the circulatory system of the infant after birth are,—

- (1) Obliteration of the umbilical vein
- (2) Obliteration of the ductus venosus
- (3) Obliteration of the ductus arteriosus
- (4) Closure of the foramen ovale
- (5) Obliteration of the hypogastric arteries

SECTION II

PHYSIOLOGY OF PREGNANCY

CHAPTER V

MATERNAL CHANGES DUE TO PREGNANCY

DURING pregnancy many demands are made on the maternal organism consequent upon the rapid growth of the fertilised ovum. The fertilised ovum requires increasing space for its proper development and an adequate blood supply for its nourishment. In consequence there is a demand on various organs associated with the general metabolism for increased activity. To meet these requirements of the growing foetus the maternal system has to undergo certain changes and these will be referred to here.

The Uterus The most marked changes are naturally noted in the uterus. In a nulliparous woman the uterus is a pear shaped organ about 3 ins long and is situated within the pelvis. At term the uterus is found to have filled up the greater part of the abdominal cavity and to have undergone considerable hypertrophy. The enlargement of the uterus is due chiefly to the hypertrophy of the existing muscle fibres and to the formation of new ones. The muscle fibres of the cervix also undergo hypertrophy but not to the same extent as those of the uterine body. The uterine connective tissue is increased and becomes softer. In the first few weeks of pregnancy the body of the uterus assumes a globular form and later becomes almost spherical. Then it becomes rapidly increased in length more than in breadth and finally assumes an oval form at the end of pregnancy. The uterus grows out of the pelvis by about the fourteenth week.

To keep pace with the growth of the uterus as well as the growing ovum the blood supply of the uterus must be very liberal. The arteries hypertrophy the veins are also increased in size the lymphatics of the uterus enlarge and multiply during pregnancy so that the full term uterus is richly supplied with blood and lymph.

The growth of the uterus is usually proportionate to the period of pregnancy but under certain conditions it may be either much larger than the period of pregnancy would warrant or even smaller. A few weeks before term there is a falling forward of the uterus which gives rise to a feeling of relief to the mother.

The Fallopian tube on either side is generally stretched out in pregnancy and is much more vascular. The uterine end of the tube is usually closed, but the fimbriated extremity remains open.

The round ligaments are thickened and hypertrophied. The ovaries are enlarged, especially the one containing the corpus luteum.

The vagina is increased in vascularity, which is one of the most marked changes during pregnancy, and consequent upon this there is a more copious secretion and the characteristic violet discoloration of pregnancy. The increased vascularity at the time

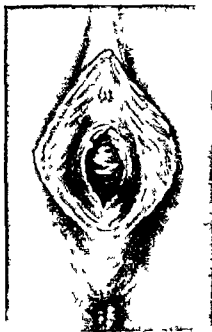


FIG. 14.—Bluish discoloration of the vagina.

of pregnancy is not confined to the genitalia, but extends to other organs in the vicinity. In consequence, there is a slight relaxation of the various pelvic joints which gives rise to an increase in their mobility.

The abdominal wall distends as the pregnancy advances and grows thinner, especially around the umbilicus. The skin over the abdomen shows depressed lines, pinkish or slightly bluish in appearance. These lines are called *striae gravidarum*. They are curved, irregular, arranged more or less concentrically, sometimes radially around the umbilicus, gradually becoming broader and deeper near Poupart's ligament. They may also be found over the thighs on the anterior aspect, sometimes on the posterior aspect.



FIG 15—Striae gra latum

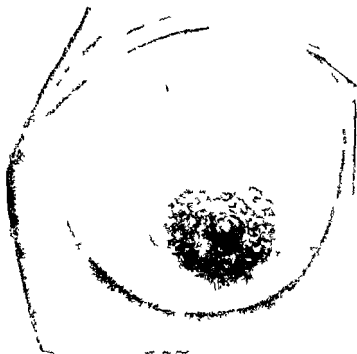


FIG 16 Breast changes in pregnancy

as far as the knees, as well as under the breasts. These lines are caused by the rupture of the subcuticular elastic fibres, and after delivery they heal up, leaving pearly white or silvery bright lines, now known as *linea albicantes*.

The Breasts Marked changes take place in the breasts consequent upon pregnancy, and such changes are more obvious in primigravidae than in multigravidae. The changes occur particularly at two different periods of pregnancy—about the second month and at the fifth month. During the second month the breasts increase in size and sensitiveness and a bluish discoloration appears in the form of streaks, especially at the periphery. The nipple becomes more erectile and with the areola, more deeply pigmented. Prominent tubercles, Montgomery's follicles, are seen in the primary areola. Later, about the fifth month, a less deeply pigmented area forms around the primary areola, which is known as the secondary areola and on this also some tubercles, secondary Montgomery's follicles may appear. After the first few months a little clear sticky fluid may be expressed from the nipples which later becomes yellowish in colour. This is known as the colostrum.

CHANGES IN OTHER SYSTEMS

Side by side with these local changes, changes are noticed consequent on pregnancy in the other systems.

Circulatory System The heart has undoubtedly more work to do during pregnancy because of the increase in the volume of the blood and the necessity to maintain the flow of the blood stream through the enlarged uterus and the placenta. Whether this increased output necessarily leads to a hypertrophy of the heart is a matter of some doubt. It is possible that the reserve power of the heart is able to cope with the increased needs during pregnancy as the strain on the heart is not sudden, but very gradual.

The Vascular System. The total volume of blood is probably increased during pregnancy, and there appears to be reason to believe that there is a definite hydremia. This results in a slight decrease in the hæmoglobin and the cellular content, but there is no true anæmia. The border line, however, between the physiological and the pathological is so indefinite that not infrequently anæmic conditions of pregnancy are noted. These will be more fully dealt with in the chapter on diseases complicating pregnancy (Anæmias).

The blood pressure normally varies between 110 mm Hg and 120 mm systolic and 75 to 85 mm diastolic. Variations in blood pressure are of extreme significance during pregnancy, and any rise up to or above 140 mm should always caution the obstetrician.

to investigate the possibilities of toxæmia developing. A low blood pressure is also of serious significance, particularly if the patient goes into labour.

Another change that may be noted in the circulatory system during pregnancy is an increased tendency to varicosity of veins particularly in the lower extremities and about the genitalia. Associated with this varicosity a certain degree of œdema may appear. Œdema in pregnancy should be thoroughly investigated, as it may be due to more serious causes.

The Respiratory System As the uterus increases in size and presses on the diaphragm the lungs are naturally displaced. The diaphragm is pushed up, the respiration becomes more costal than abdominal and in some cases it may be deeper and more frequent.

Certain changes in the nose and throat are said to be characteristic. The turbinated bones are turgid and thickened and may sometimes close the nares. The larynx is somewhat congested and the voice may be affected.

Digestive System During the early weeks of pregnancy in the first trimester, minor disorders of digestion are not infrequent. Nausea and vomiting, spoken of generally as morning sickness, start about the sixth week and usually continue to the twelfth week. In some cases they may start much earlier even during the second week, and persist for a much longer time. Vomiting may occur even in the later weeks of pregnancy and occasionally it may be so exaggerated as to be termed *Hyperemesis gravidarum*. It is more prominent in primiparæ. There is increased salivation and a tendency to constipation.

The liver is the seat of marked changes during pregnancy. The whole organ is enlarged and hyperæmic. There appears to be a definite decrease, if somewhat slight, in the functional capacity of the liver. The stomach is displaced in the later months of gestation being forced upwards backwards and to the left. The intestines are also affected, hæmorrhoids are common partly due to the constipation and partly to the increased venous pressure below the diaphragm.

Urinary System The kidneys are subject to a considerably increased strain during pregnancy. The urine is usually increased in quantity, the specific gravity is low and in some cases albumin may appear, particularly in the later weeks. Sugar may also be occasionally found in the urine during gestation and may be due to the absorption of the milk sugar from the functioning breasts. Hypertrophy and atony of the ureters may occur. The ureters may sometimes be compressed by the growing uterus, and under such conditions a mild infection develops which may eventually result in a pyelitis.

In the early months the bladder is compressed by the growing uterus giving rise to increased frequency of micturition which is one of the symptoms noted at this period

The Skeleton Skin and Teeth During pregnancy the bones show increased vascularity. The various pelvic joints become more mobile and sometimes they may become so relaxed that locomotion is not comfortable. The skin is much affected and pigment is deposited in certain definite areas—the nipples the vulva the linea alba the navel and the face. In some women the pigmentation is much more marked than in others. The teeth are prone to decay and this is perhaps due to a deficiency in the calcium content resulting from the increased demand for it by the growing fetus.

Nervous System The nervous system is in a more excitable condition in the pregnant woman. Temperamental changes are not infrequent. Melancholia and real psychosis may develop especially in those with a familial tendency.

The Endocrine System Perhaps the most remarkable changes in pregnancy occur in the endocrine system. Their full significance is not yet clearly understood but recent literature would make it appear that these glands play a dominant part in the physiology of pregnancy and they will be described in detail in the chapter on Endocrinology in Obstetrics in the Appendices.

CHAPTER VI

THE SIGNS SYMPTOMS AND DIAGNOSIS OF PREGNANCY

ALTHOUGH in the majority of cases the diagnosis of pregnancy is fairly simple sometimes in those very cases where a certain diagnosis is of the utmost importance difficulties may be encountered which make it impossible to arrive at a definite conclusion. A number of signs and symptoms taken together generally help in arriving at a positive diagnosis of pregnancy, and in the latter part of pregnancy single signs may render the diagnosis probable or even positive. It is however, judicious to be reserved in the expression of one's opinion if there is any doubt as to the condition.

An expression of opinion may involve serious consequences legal and social. Unfortunately to the lay mind it seems inexcusable for errors in diagnosis to occur. Mistakes can only be avoided by observing the greatest care in each detail of the examination and by a thorough consideration of all the signs and symptoms present. Not much emphasis however can be laid on

the patient's statements, as in some cases at any rate the patient may, consciously or unconsciously, mislead the physician into an erroneous position. The physical signs are of far greater importance than the symptoms, and are obtained by means of sight, touch and hearing, that is, by inspection, palpation percussion and auscultation, together with such other methods of examinations as are detailed later.

In the diagnosis of pregnancy we take into consideration—

- (1) Subjective symptoms, that is, those symptoms which the patient herself feels and communicates to the physician, and
- (2) Objective signs, or those which the physician is able to ascertain for himself.

The signs and symptoms vary with the different periods of pregnancy, and we shall classify them into the three epochs in pregnancy, namely, the first, second and third trimesters of pregnancy.

FIRST TRIMESTER

(First twelve weeks of pregnancy)

Subjective Symptoms These are —

- (1) Amenorrhœa
- (2) Morning sickness
- (3) Salivation, changes in disposition
- (4) Irritability of the bladder

Amenorrhœa As a general rule this is the first warning of pregnancy to women who have been exposed to impregnation. It is, however, not a reliable symptom because there are several conditions where amenorrhœa may occur without conception and in some cases it is not present even when pregnancy has occurred. However, when occurring in healthy women who have menstruated regularly previously, it is strongly presumptive of pregnancy. Various chronic diseases, such as tuberculosis, anemia, sypilis, some acute affections such as pneumonia and dysentery, may cause a cessation of the menstrual flow either permanently or temporarily. Change of climate, exposure to cold, mental emotions, general debility, excessive desire to become pregnant or a fear of pregnancy, may also be instrumental in bringing about a cessation of the menses. Pregnancy may occur in women in whom the menstrual flow does not appear, as in women during lactation, again menstruation may continue during pregnancy for two reasons. In the early weeks of pregnancy it is possible that menstruation may occur once or twice before the fusion of the decidual membranes and in those rare cases of malformations of the uterus like uterus didelphys menstruation may occur from

one half of the uterus while the other is the seat of pregnancy. Again hemorrhages of a pathological character may occur during pregnancy due to diseases of the genital tract. It is thus seen that while amenorrhoea is ordinarily a valuable symptom it cannot alone help us to a definite diagnosis of pregnancy.

Morning Sickness Nausea and vomiting are usually associated with pregnancy in the early weeks. Morning sickness generally begins about the fourth to sixth week of pregnancy and may continue till about the sixteenth week. Usually it is present in the early hours of the morning and shows signs of abatement as the day progresses. In some cases however sickness may continue throughout the day. Sometimes nausea is more persistent than vomiting. Occasionally we have seen cases of nocturnal vomiting the patient feeling comfortable till evening when she begins to have a feeling of nausea and vomiting occurs during the night. In some cases there may be no morning sickness.

So long as it does not affect the general health morning sickness is a physiological phenomenon associated with pregnancy. Occasionally it may become a pathological symptom when the nausea and vomiting may become so excessive as to prevent the possibility of any nourishment being retained or even taken by the patient. This excessive vomiting—hyperemesis gravidarum—is a pathological symptom and may seriously endanger the patient's life. Vomiting may however be due to other causes referable to the gastro intestinal tract or to certain diseased conditions of the pelvic organs where the symptom is not infrequent.

Salivation and Changes in Disposition Salivation is an early symptom and is pronounced in certain cases. The changes in disposition may be shown by a change in the temperament resulting in the patient becoming irritable and capricious. She may evince a desire for articles of food quite at variance with her ordinary inclinations. These have been termed the longings or *pica* of pregnancy. They are not of diagnostic value as they are purely subjective and may occur in various other neurotic conditions.

Irritability of the Bladder Frequency of micturition is sometimes complained of and is due to the pressure exerted on the bladder by the growing uterus. As the uterus increases in size and becomes an abdominal organ this pressure is relieved and the symptom gradually disappears.

Objective Signs These are —

- (1) Changes in the breast
- (2) Bluish discoloration of the vulva and vagina
- (3) Changes in the shape size position and consistency of the uterus
- (4) Softening of the cervix and vagina
- (5) Hegar's sign

Changes in the Breast Changes in the breast are marked particularly in primigravida. There is a general enlargement of the organ with prominence of the veins and pigmentation forming the characteristic primary and secondary areolæ. The nipples also become more prominent, erectile and turgescient. Montgomery's follicles appear first on the primary areolæ and later on the secondary areolæ. The secondary areola develops from the fifth month onwards while the other changes generally take place during the first trimester—from the fourth to the twelfth week of pregnancy. The presence of a little fluid in the breast can usually be detected from the twelfth week onward by gently squeezing the breast in the direction of the nipple. The fluid is clear and contains some colostrum corpuscles.

While breast changes are constant in pregnancy they may also be brought about by certain other pathological conditions of the uterus and ovary. In multiparæ the changes in the breasts are not of much diagnostic value because pregnancy may take place in a lactating woman and the pigmentation of the areolæ and the milky secretion in the breasts may persist after a previous pregnancy. While the absence of these signs does not prove the non-existence of pregnancy their presence cannot help us to a positive conclusion unless supplemented by other signs. ✓

Bluish Discoloration of Vagina This sign is generally detected between the fourth and eighth week of pregnancy and it increases in intensity up to the sixteenth week when it has perhaps reached its maximum. It persists throughout pregnancy. The vulval and vaginal mucous membranes consequent upon the congestion of the blood vessels present a violet or light blue tint and later a purplish or deep blue tint. This sign was first described by Jacquemier and later emphasised by Chadwick and is therefore known as Jacquemier's sign or Chadwick's sign.

Besides this discoloration there may be a sensation of increased warmth in the genitalia resulting from the augmented blood supply to those parts. At a later stage increased vaginal pulsations may be noticed and this sign is sometimes spoken of as Oslander's sign. This may however be produced in non pregnant conditions such as fibroids and pelvic inflammations, and cannot therefore be depended on for a diagnosis.

Uterine Changes The uterus is perhaps the most important organ to undergo remarkable changes due to pregnancy. In the early weeks of pregnancy changes in volume, shape and position occur. These can be made out by bimanual examination either by the abdomino-vaginal method or in some rare cases where such vaginal examination is impossible by the abdomino rectal method of palpation.

The virgin uterus is pyriform or pear shaped and flattened from before backwards. During the first eight to ten weeks of gestation

the organ loses its flattened pear shape and gradually becomes rounded or globular. On account of its increased weight the uterus

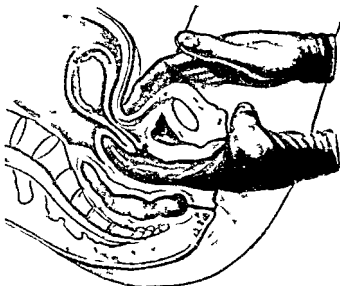


FIG 17 Method of eliciting Hegar's sign Method

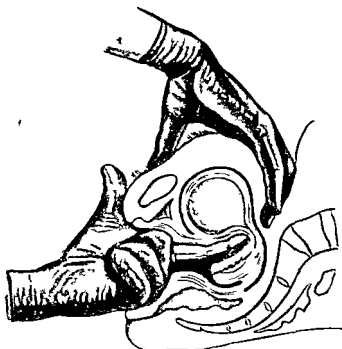


FIG 18 Method of eliciting Hegar's sign Method

in the early weeks of pregnancy sinks down into the pelvic cavity. After the twelfth week it rises gradually upwards towards the abdomen.

Alterations take place in the consistency of the organ and it becomes much softer. The softening is particularly noticeable in the cervix and the lower uterine segment. This softening of the cervix is an important sign and can be recognised from the fourth week onwards. At first confined to the cervical mucous membrane it gradually involves the deeper tissues till the whole cervix becomes softened. The comparison has been made that the cervix in the non gravid condition is as hard as the tip of one's nose and

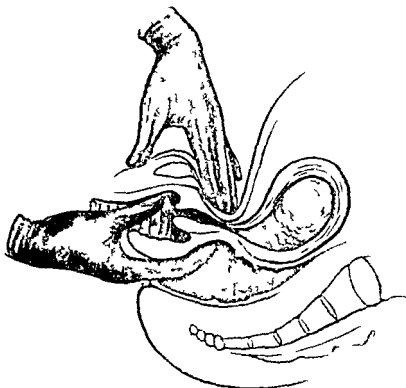


FIG. 19.—Method of eliciting Hegar's sign. Method 3

that in pregnancy it becomes as soft as one's lips or the lobe of the ear.

Softening and compressibility of the isthmus or lower uterine segment constitute what is known as Hegar's sign. This is of great value and has been observed from about the sixth or eighth week to the twelfth week of pregnancy. This sign is more difficult to recognise in multiparæ than in primiparæ but when definitely present constitutes one of the most valuable of physical signs in the recognition of pregnancy at this period.

Hegar's sign can be elicited in several ways —

(1) In women with a lax abdominal wall and a roomy vagina two fingers are introduced into the vagina and passed posteriorly

behind the cervix, while the fingers of the other hand are pressed down into the abdomen from above the symphysis pubis. The fingers of the two hands will almost meet as if there was no resisting tissue in between and the cervix and body of the uterus will appear as two independent masses.

(2) In cases where the abdominal wall is not lax, the index finger may be passed into the rectum, while the thumb is inserted in the vagina in front of the cervix into the anterior fornix. The soft, almost papyraceous, consistency of the lower uterine segment can be felt between the finger and the thumb.

(3) In some cases two fingers may be passed behind the cervix into the posterior fornix and the thumb in front of the cervix into the anterior fornix. With the other hand the fundus is pressed towards the symphysis pubis, so that the uterus is in an anteflexed position. In this way the soft lower uterine segment can be recognised between the two fingers and thumb.

SECOND AND THIRD TRIMESTERS OF PREGNANCY

Subjective Symptoms. During this period certain of the signs and symptoms that were present in the earlier periods of pregnancy gradually disappear and other signs and symptoms become apparent. Morning sickness, increased salivation and frequency of micturition generally disappear by this time. An important symptom that may be felt during the second trimester is *quickening*. The active foetal movements are generally first felt by the mother at the end of the sixteenth week, and the term *quickening* applied to this first recognition, arose out of the erroneous impression that only when the mother became conscious of the spontaneous movements of the foetus was life imparted to the foetus. This movement of *quickening* has been compared to the fluttering of a bird imprisoned in the hand. The movements become more vigorous and may sometimes be painful and disgusting for the patient. They increase after fasting and may cease entirely in some cases although the foetus continues to be alive. Their sudden and complete cessation, however, is suggestive of death of the foetus *in utero*. Foetal movements may be mistaken for many other conditions. Thus the irregular muscular contractions of the abdominal muscles, the peristaltic movements of the intestines and the movements of a wandering kidney or spleen may simulate foetal movements and may be mistaken therefor.

The date of "quickening," if definitely ascertainable from the patient, is important for purposes of reckoning the period of pregnancy and calculating the probable date of delivery.

Objective Signs. The objective signs of this period of pregnancy are of extreme importance, as they furnish a definite

and reliable guide to the positive diagnosis of pregnancy These signs are, in the second trimester —

- (1) Changes in the skin
- (2) Changes in the size of the uterus
- (3) Intermittent uterine contractions
- (4) Active foetal movements
- (5) Palpation of the foetal parts
- (6) Auscultatory signs
- (7) Passive foetal movements

Changes in the Skin Pigmentation is one of the characteristic changes that take place in pregnancy This is more marked in the forehead and cheeks, in the form of dark brown patches noticed more particularly in brunettes Pigmentation and striae may also be noticed on the breasts and over the abdominal wall A linear pigmented area stretching from the umbilicus to the symphysis pubis is of deeper colour and is known as the linea nigra On either side over the abdominal wall are other striae, whitish in appearance and spoken of as linea albicantes

Changes in the Shape and Size of the Uterus The uterus being a progressively growing organ in pregnancy gradually increases in size, becomes ovoid in shape, and can be felt at different levels in the abdomen in successive periods of pregnancy

Intermittent Uterine Contractions This is known as Brazton Hick's sign, and it is found irrespective of whether the foetus is alive or dead It may be detected by palpation as early as the sixteenth week These contractions as a rule occur every five or six minutes and last from two to five minutes They may be easily elicited by keeping the hand in full contact with the abdominal wall over the uterus, when the gradual relaxation and contraction of the uterine musculature will be felt

Active foetal movements when felt, seen or heard afford positive evidence of pregnancy and of a live child They may be noticed after the sixteenth or eighteenth week of pregnancy, but more generally during the last trimester

Palpation of the Foetal Parts About the middle of pregnancy the foetus is generally increased to a size when it can be recognised by abdominal palpation As pregnancy progresses this sign is of great value, not only in detecting pregnancy but also in ascertaining the various positions of the foetus *in utero*

Auscultatory Signs Auscultation over the abdominal wall during pregnancy is useful to elicit various sounds, some of which are of great importance in the positive diagnosis of pregnancy

(a) *The Foetal Heart* The foetal heart can be heard about the sixteenth week of pregnancy and resembles the ticking of a watch heard through a pillow This is the only sign of pregnancy which

by itself and in the absence of all others is perfectly reliable for the diagnosis of pregnancy. The point of greatest intensity of the foetal heart sounds will vary with the position of the child *in utero*. Ordinarily the foetal heart beats between 130 to 150 times a minute.

(b) *The Funic Souffle*. This is a soft murmur synchronous with the foetal heart beat heard rarely, and said to be an unfavourable sign, indicative of foetal distress, if persistent. It is due to obstruction to the rush of blood through the umbilical arteries caused by compression of the umbilical cord through knots, twists or pressure by extrinsic factors.

(c) *The Uterine Souffle*. This is easily detected from the fifteenth or sixteenth week, and is a soft blowing or musical murmur, synchronous with the maternal heart beat. It may be heard, however, in conditions of uterine enlargement from causes other than pregnancy. It is due to the passage of blood through the dilated uterine vessels.

Other sounds that may be heard are due to the movements of the foetus to intestinal movements, and to the contractions of the abdominal muscles themselves.

Passive Foetal Movements. These may be elicited by internal or external manipulations producing a passive movement of the foetus *in utero*.

(a) *Internal Ballotement*. This sign may be obtained from the sixteenth week till about the twenty-eighth week of pregnancy. To elicit this sign the patient is placed in the dorsal posture, the index and middle fingers are introduced into the vagina and steadied against the lower pole of the foetus, which is pressed down by the other hand over the abdomen. The fingers in the vagina give a sharp tap upwards. The impulse thus generated is transmitted to the foetus which bounds upward and then after a moment falls back upon the examining fingers. If clearly elicited it must be considered as one of the most valuable signs of pregnancy at this period. Rarely, some pathological conditions may give rise to a very similar sensation, for example, a calculus in the bladder, a fibroid or ovarian tumour complicated with ascites, but in such cases no other sign of pregnancy will be present. Before the sixteenth week the foetus is too small to respond to the digital impulse and after the twenty-eighth week the foetus is relatively too large, filling so much of the uterine cavity that it cannot be moved about as freely as formerly. This sign may not be elicited in conditions associated with a deficiency of the liquor amni or where the foetus is not presenting by the cephalic pole.

(b) *External Ballotement*. This sign is elicited with the patient in a recumbent position by steadying the uterus with one hand applied to the side and gently tapping with the other hand from the opposite side, when the impact of the foetal parts will be felt.

It depends upon the amount of liquor amni present in the uterine cavity. It may sometimes be elicited in cases of fibroids or ovarian tumours associated with ascites. It is difficult to elicit in cases where the abdominal wall is thick and fatty and in conditions where the liquor amni is very much diminished in quantity.

THIRD TRIMESTER

During this period of pregnancy the painless uterine contractions persist, the foetal movements are more easily felt and seen, ballottement is generally not obtainable, foetal parts are easily palpable while the foetal heart is well heard if the foetus is alive and the uterine souffle definitely made out. The uterus progressively enlarges till at term it fills almost the whole of the abdomen.

Summary of the Diagnostic Signs of Pregnancy. The signs of pregnancy may be divided into three classes —

- (1) Certain or positive signs,
- (2) Probable signs, and
- (3) Doubtful signs

(1) The *positive or certain signs* are —

- (i) Palpation of foetal parts
- (ii) Auscultation of the foetal heart sounds
- (iii) Foetal movements active or passive
- (iv) The funic souffle or umbilical murmur if present
- (v) The skeleton of the foetus when seen in a skiagram

(2) The *probable signs* are —

- (i) The progressive enlargement of the uterus and its characteristic alterations in shape
- (ii) The compressibility of the lower uterine segment—*Hegar's sign*
- (iii) Intermittent uterine contractions—*Braxton Hick's sign*
- (iv) Changes in the consistency of the enlarging uterus
- (v) Changes in consistency and colour of the vagina and cervix
- (vi) Uterine souffle
- (vii) Cessation of menstruation
- (viii) Mammary signs—enlargement of the breasts and *Montgomery's tubercles*
- (ix) Pigmentation of the skin

(3) The *uncertain or doubtful signs* are —

- (i) Changes in the size and shape of the abdomen
- (ii) Reflex phenomena such as nausea vomiting
- (iii) Pressure signs such as irritability of the bladder or rectum
- (iv) Cutaneous signs such as chlorasma on the forehead and cheeks and dark circles under the eyes

The Zondek Aschheim test, though not a certain sign of pregnancy, is positive in 98 per cent of cases, and is particularly of value in the early weeks of pregnancy

The signs and symptoms of pregnancy may now be classified according to the time at which they appear —

First 4 Weeks There is cessation of menstruation, associated with softening of the cervix

4 to 8 Weeks Hegar's sign may now be obtained, pulsations in the vaginal fornices, nausea and vomiting, frequency of micturition, and mammary changes may be noted. Definite enlargement of the uterus may also be noted

8 to 12 Weeks The softening of the cervix increases, gastric and mammary changes continue, Hegar's sign may be elicited, the uterus has changed in shape, size and consistency and can be definitely felt as a globular organ, of the size of a foetal head

12 to 16 Weeks The uterus begins to rise into the abdominal cavity the abdomen becomes enlarged, the breast changes increase and as a rule, the gastric disturbances cease. At the end of this period the foetal heart sounds may occasionally be heard. The uterine souffle is present, the patient sometimes feels quickening and the examiner may detect foetal movements as well as uterine contractions. Internal ballottement may also be obtained

16 to 20 Weeks The abdominal enlargement is much more obvious and "quickening" definitely felt. The mammary changes continue with the appearance of the secondary areolæ, ballottement readily reveals the presence of the foetus and foetal heart sounds are audible

20 to 24 Weeks The foetal heart sounds and movements are all evident. The fundus of the uterus is at the level of the umbilicus, cutaneous striæ develop

24 to 28 Weeks The fundus is now three fingers' breadth above the umbilicus, ballottement is still obtainable, cutaneous striæ continue to develop

28 to 32 Weeks Ballottement is hardly obtainable. The fundus is now half way between the umbilicus and the ensiform cartilage. The abdomen is much enlarged and is pear shaped. Foetal parts are now easily palpable

32 to 36 Weeks Ballottement is no longer obtainable, although the other physical signs are all more marked. The fundus at the end of this period is almost at the level of the ensiform cartilage

36 to 40 Weeks The physical signs are distinct. At the middle of this period the fundus is at its greatest height, it then sags forwards and settles down in the last two weeks thereby lessening the pressure symptoms and the patient feels lighter and more comfortable. The vertex is usually engaged in the pelvis in primigravidae.

DIFFERENTIAL DIAGNOSIS OF PREGNANCY

Pregnancy may have to be differentiated from other conditions which produce an enlargement of the uterus. Among the conditions which may lead to an error in diagnosis in the *early months of pregnancy* may be mentioned —

- (1) Subinvolution of the uterus
- (2) Hæmatometra and chronic metritis
- (3) Interstitial or submucous fibroids

Subinvolution of the uterus and chronic metritis may result in a slight increase in the size of the uterus but some of the characteristic signs and symptoms of early pregnancy are not noted. Thus Hegar's sign is not present, the uterus is not of the characteristic globular shape and there may be pain in the back or over the hypogastrium with tenderness of the uterus. In subinvolution there is often a history of abnormal menstruation together with a bloody muco-purulent discharge.

Hæmatometra is a condition caused by the retention of menstrual fluid in the body of the uterus as a result of closure of some portion of the cervical canal either at the internal os or the external os or in the cervical canal itself. The accumulation of the fluid causes a uniform enlargement of the uterus and the tumour increases in size periodically at these times being accompanied by greater pain and tenderness. It is associated with amenorrhœa but a careful examination will detect the obstruction and the nature of the uterine enlargement which is soft and fluctuant or possibly tense. These findings together with the history of the case will reveal the diagnosis.

Fibroid tumours of the uterus particularly interstitial fibroids may occasionally give rise to a uniform enlargement of the uterus, and in some cases owing to changes in the ovaries they may be associated with some degree of amenorrhœa. The absence of Hegar's sign together with the comparatively harder feel of the uterus and the absence of early symptoms of pregnancy such as salivation morning sickness etc. may serve to put one on guard in considering the diagnosis. It must however be stated that occasionally a gravid uterus has been mistaken for a fibroid and a hysterectomy has not been infrequent. Even after opening the

abdomen the uniformly enlarged condition of the uterus, together with the peculiar colour, has given room to doubt whether the condition was one of pregnancy or fibroid. A simple test will help to settle the diagnosis. The needle of a hypodermic syringe is passed into the enlarged uterus and in cases of fibroids the needle will enter with some degree of resistance, while if the condition is a pregnancy the needle will slip in more easily and clear fluid (liquor amnii) can be withdrawn. This is a certain way of differentiating between fibroids and pregnancy, and is valuable in those cases where pregnancy is also complicated by fibroids.

A valuable aid in the differential diagnosis of this condition is the Zondek Aschheim test already referred to. If the pregnancy has advanced to nearly sixteen weeks, radiographic examination will be of great help.

In the latter half of pregnancy a diagnosis may have to be made from ovarian cysts and uterine fibroids. The following points will help to differentiate the three conditions —

<i>Pregnancy</i>	<i>Uterine Fibroids</i>	<i>Ovarian Tumours</i>
1 Amenorrhœa usually present	No amenorrhœa occasionally menorrhagia if submucous or interstitial fibroid	No amenorrhœa unless bilateral
2 On abdominal palpation Tumour is somewhat soft and intermittent contractions can be noted together with some degree of fluid thrill	Tumour hard and irregular no signs of intermittent contractions generally	Cystic swelling does not show any signs of contraction presence of a thrill depends upon the nature of the contents
3 Fœtal parts can be felt	No fœtal parts felt	No fœtal parts felt
4 Fœtal heart sounds and possibly funic souffle heard	No fœtal heart sounds heard	No fœtal heart sounds heard
5 Breast changes noted	No mammary changes	No characteristic mammary change
6 Ballottement may be elicited	No ballottement	No ballottement
7 Zondek Aschheim test positive	Negative	Negative
8 Radiographic examination shows definite evidence of fœtal skeleton	A vague shadow but no fœtal parts	A vague shadow but no fœtal parts

Pseudocyesis. This condition occurs in women who have an intense desire to become pregnant. Most frequently it is observed in a woman who is approaching the menopause when her menstrual flow has become scanty or has ceased for a time. A deposit of fat takes place in the anterior abdominal wall and the intestines become

distended by flatus. In such cases several of the doubtful signs and symptoms of pregnancy may be present for example menstruation may cease the mammary signs of gestation may appear and the abdomen may become progressively more prominent the patient may imagine that she feels foetal movements striae may appear both on the abdomen and breasts. In some cases the condition may go on and eventually spurious labour occur.

The diagnosis of this condition is not difficult but the physician should be on his guard in assessing any statements the patient may offer in regard to her condition and arrive at a definite diagnosis by the exclusion of the probable and uncertain signs of gestation. It will be well for him to submit the patient to an examination under anaesthesia. Care must be taken in these cases to see that an attendant or a relation in whom the patient has got confidence is present during this examination so that later the woman may not persist in imagining that her pregnancy was terminated.



FIG. 0.—Pseudocyesis

An X ray is useful in such cases needless to say the Zondek Aschheim test will invariably be negative.

Diagnosis between First and Subsequent Pregnancy In the large majority of cases it is not difficult to diagnose whether the patient is pregnant for the first time or has had children previously. In some cases where the woman has had an abortion or a premature foetus the signs may not be quite characteristic. The following are the points for consideration —

(1) *The Condition of the Mammae* In a primigravida the mammary gland is firmer fuller and the areola and the Montgomery's follicles are more prominent. In a multipara the breasts are more flabby and pendulous with old white striae and prominent nipples.

(2) *The Abdominal Wall* This is more relaxed and easily thrown into folds in a multipara and the striae may be much more prominent. Striae may however occur in other conditions causing rapid distension of the abdomen such as ascites ovarian cysts or adiposity.

(3) *The Vagina* In virgins the hymen is intact unless there has been any surgical interference sufficient to cause its rupture. In a nulliparous woman the hymen is usually torn but it remains can be readily made out. In a parous woman on the other hand

the hymen has almost entirely disappeared and is only represented by warty prominences known as *carunculae myrtiformes*. There are, however, rare cases where an elastic hymen has stretched so that even after child birth it is present. Besides the hymen in a nulliparous woman the fourchette is intact and the perineum not lacerated. In a parous woman on the other hand the fourchette has almost invariably been torn and the perineum shows evidence of previous laceration in the form of scars.

In a nulliparous woman the vaginal mucous membrane is rugose but in a parous woman the rugae have disappeared and the vaginal orifice is larger and may be gaping.

(4) *The Cervix* One of the most important signs of parity is found in the condition of the cervix. In a nulliparous woman the external os is circular, the mucous membrane smooth and intact and the orifice closed. In a parous woman on the other hand the



FIG. 91

A Cervix in a nulliparous woman

B Cervix in a parous woman

Note the transverse slit and the irregular cicatrices

orifice is a transverse slit and may admit the tip of the finger. There is usually at least a small laceration present. In certain conditions where a premature labour or abortion has occurred the cervix may not show the characteristic signs. On the other hand as a result of operative manipulations the cervix of a nullipara may be torn and resemble a multiparous cervix.

The Duration of Pregnancy and the Probable Date of Confinement The period of gestation reached during a pregnancy may be ascertained by —

- (1) The period of amenorrhœa
- (2) The height of the uterus at different periods of pregnancy
- (3) The measurements of the foetal ovoid in certain cases, and
- (4) Noting the date of quickening if it can be ascertained reliably

(*) *Amenorrhœa* The usual period of pregnancy may for all practical purposes be taken as ten lunar months or 280 days.

calculated from the first day of the last menstrual period. The difficulties in regard to this are that occasionally the date of the last period may not be ascertainable or conception has occurred during a period of amenorrhœa following a previous confinement or due to certain diseased conditions. In some rare cases the menstrual flow may occur once or twice after the commencement of pregnancy before amenorrhœa is established.

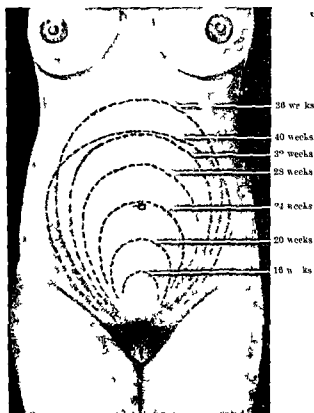


FIG — Height of uterus at varying periods of pregnancy

(2) *By the Height of the Uterus* In a normal case of pregnancy the uterus enlarges uniformly and is proportionate to the period of pregnancy. It is more or less a pelvic organ up to twelve weeks and from then onwards gradually rises into the abdomen. The height of the uterus according to the period of gestation is as follows —

- | | |
|-----------|--|
| 16th Week | Just palpable above the symphysis pubis |
| 20th Week | Midway between the umbilicus and the symphysis pubis |
| 24th Week | Up to the level of the umbilicus |

- 28th Week Three fingers breadth above the level of the umbilicus
 32nd Week Midway between the umbilicus and the ensiform cartilage
 36th Week Almost at the level of the ensiform cartilage
 40th Week At the level of the uterus at the 3rd week but there is a falling forward of the fundus

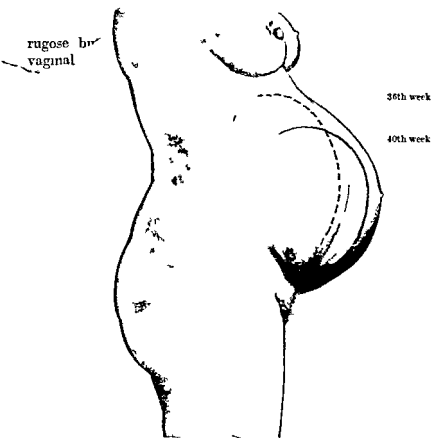


FIG. 93.—The heights of the uterus at the 36th and 40th weeks of pregnancy.
 Note the falling forward of the fundus at the 40th week.

The calculation of the period of pregnancy from the height of the uterus may however be vitiated by certain conditions. The uterus may be much smaller and the height therefore much less than the period of amenorrhœa would indicate in the following conditions —

(1) *In the first half of pregnancy—*

- (a) Extrauterine gestation
- (b) Death of the ovum resulting in a missed abortion
- (c) Retroverted gravid uterus
- (d) Oligo hydramnios

The uterus, on the other hand, may be bigger in the following conditions —

- (a) Hydatidiform mole
- (b) Hydramnios
- (c) Tumours of the uterus or of the adnexa in association with pregnancy

(u) *In the later weeks of pregnancy—*

The uterus may be smaller than the period of amenorrhœa would warrant in the following conditions —

- (a) Oligo hydramnios
- (b) Premature death of the fœtus where there is arrest of the development of the fœtus and consequent cessation of enlargement of the uterus
- (c) In some cases of sacculation of the uterus
- (d) In an oblique or transverse lie of the fœtus

The uterus may be much more enlarged in the following conditions —

- (a) Hydramnios acute or chronic
- (b) In multiple pregnancy
- (c) Concealed accidental hæmorrhage
- (d) In severe cases of contracted pelvis in primigravida
- (e) Sometimes with abnormally big fœtuses
- (f) When tumours of the uterus or adnexa are associated with pregnancy
- (g) Fœtal monstrosities or abnormalities such as hydrocephalus hydrothorax hydroperitonæum distended bladder, double monsters or in tumour of the abdomen of the fœtus

These conditions have to be borne in mind in arriving at any conclusion as to the period of pregnancy calculated from the height of the uterus

(3) *The length of the fœtal ovoid* can be directly measured during the second half of pregnancy by calipers, one blade of which is placed over the lower pole of the fœtus and the other over the upper pole near the fundus of the uterus. The length of the fœtal ovoid in inches gives some idea of the period of gestation. After birth however the age can be ascertained by direct measurement of the length of the embryo or fœtus.

An easy rule that may be applied after delivery is as follows ascertain the length of the fœtus in centimetres, and note that the length is generally the square of the number of the lunar month up to the fifth month and thereafter it is obtained by multiplying the number of the month by 5. Thus at the fourth

month, the length will be 4×4 or 16 cms, at the seventh month, 7×5 or 35 cms

(4) *From the Date of "Quickening"* Quickening generally occurs about the eighteenth week of pregnancy, and if it can be definitely ascertained, particularly in multipare, the probable period of gestation may be calculated.

How to calculate the Probable Date of Confinement
(1) *From the Date of the Last Normal Menstrual Period* Get the actual date of the first day of the last menstruation, add seven days and count back three months. If a leap year intervenes, add six days only. For example, if the first day of the last menstrual period be 1st October, add seven days, which brings us to the 8th of October, and count back three months, which brings us to the 8th of July. The 8th of July of the succeeding year will then be the probable date of confinement.

(2) *From the Date of "Quickening"* If this can be ascertained definitely add twenty two weeks to the date of quickening, which gives the probable date of confinement.

(3) *From the Height of the Uterus* An approximate idea may be obtained about the probable date of confinement by noting the height of the uterus at the various weeks as already detailed. In ascertaining the height of the fundus, care must be taken to see that the bladder is emptied, the patient is in a recumbent position, and that the uterus is not contracting at the time of palpation. In all cases where the height of the uterus is approximately that found at the thirty second week, the patient must be made to sit up to see if there is any falling forward of the uterus, so as to ascertain whether it is the thirty second or the fortieth week of pregnancy that has been reached.

In certain cases, besides those already mentioned the height of the uterus may not give an exact indication of the period of pregnancy. In those cases where the back of the foetus is posterior, the flattening of the abdominal wall and the consequent change from the normal contour of the uterus gives rise to some error in the calculation of the probable date of confinement from the height of the uterus. In some cases the gravid uterus is pushed to one side generally to the right, and in such cases the height of the fundus should be ascertained after bringing it to the median position.

(4) *Fixation of the Head* In normal cases of pregnancy where the pelvis is normal and the foetus is presenting by the cephalic pole, the head generally becomes fixed two or three weeks before the onset of labour in a primipara and within forty-eight hours of the onset of labour in a multipara. Fixation of the head, therefore, is an aid in calculating the probable date of confinement in both classes of case.

Diagnosis of Intra-uterine Death of the Fœtus That the fœtus is alive or dead in the uterus may be ascertained from the following details —

(1) The Fœtal Heart If this is heard it is a positive sign not only of pregnancy but of fœtal life. There are certain conditions where the fœtal heart may not be easily audible. Such conditions are —

(1) Hydramnios.

(2) A fat abdominal wall particularly with associated œdema.

(3) In conditions where the bladder is distended or there is much flatulence of the intestines.

(4) In malpositions or malpresentations of the fœtus.

A hurried and casual examination may not reveal the presence of the fœtal heart. Care must be taken, therefore to see that the patient is in the recumbent posture, that the bladder and the bowels are emptied and, if necessary repeated auscultation must be performed to ascertain definitely the presence or otherwise of the fœtal heart. It may not be audible during the height of a uterine contraction in labour. It is rarely present in cases of prolonged labour. Sometimes the maternal aortic pulsation may be mistaken for the fœtal heart. When once heard absence of fœtal heart sounds on repeated examination is very suggestive of intrauterine death.

(2) Fœtal Movements These when seen or palpated form a positive sign of the life of the fœtus. In some cases the fœtal movements are not palpable and may not be seen and the patient herself may not feel them. If there is sudden cessation of fœtal movements and this persists, it is suggestive of intrauterine death of the fœtus.

(3) Cessation of Growth of the Uterine Tumour If observed over a period of time the uterus does not show any sign of increase in size part passu with the period of amenorrhœa, it is strong presumptive evidence that the fœtus is dead.

(4) Retrogressive changes of pregnancy is noted in the breasts. The breasts cease to grow become flabby and pendant and the engorgement of the vessels gradually diminishes.

(5) Occasionally after intra uterine death of the fœtus the mother may show some signs of toxic absorption associated with loss of weight general malaise and slight rise of temperature.

(6) A radiographic examination is one of the certain methods of diagnosing intra uterine death. Where the child has been dead for some time and has undergone maceration overlapping of the bones of the fœtal skull, recognisable at a radiographic examination is almost conclusive evidence.

(7) In such cases, palpation may also be of considerable help, as the loose, freely movable foetal skull bones can be palpated abdominally or made out by vaginal examination

CHAPTER VII

DIAGNOSIS OF PREGNANCY

Aschheim-Zondek Test and Radiological Diagnosis

THE difficulty that sometimes arises in making a definite diagnosis of pregnancy before any of the positive signs manifest themselves, have induced several workers to devise laboratory tests for this purpose. One of the earliest to experiment along these lines was Abderhalden, who in 1912 described a method for ascertaining the existence of pregnancy by means of certain changes occurring in the blood serum of the woman. Other workers followed along these lines in an attempt to determine the possibility of ascertaining the presence of some specific ferment in the maternal blood which possessed the power of neutralising the foetal elements that are constantly gaining access into the maternal blood stream.

Aschheim-Zondek Test The most important of all pregnancy tests is the Aschheim Zondek test. Aschheim and Zondek demonstrated in 1928 that the urine of pregnant women contained a hormone which had definite properties. It has been proved that this hormone is similar to the gonadotropic hormone of the anterior pituitary gland, and that it is secreted in fairly large quantities in the urine of pregnant women from an early stage of pregnancy.

The test is performed as follows. Immature female mice, twenty five to thirty days old, are used for this test. About 25 to 30 c c of fresh filtered morning urine of the woman is taken and shaken up with 90 to 120 c c of ether for three to five minutes, and the ether is then separated off. To the residual urine 0.9 gm of glucose is added. The urine is injected into five mice in varying doses, from 0.2 to 0.4 c c for two days, thrice daily. The injections are given as follows —

Mouse 1	.	6 × 0.2 c c of urine
" 2		6 × 0.25 "
" 3		6 × 0.3 "
" 4		6 × 0.35 "
" 5	.	6 × 0.4 "
" 6	.	Control—no injections

A positive reaction may always be expected within seventy two hours. The abdomen of the mouse is opened and the ovaries

examined. The following changes may be noted when the reaction is positive: the ovaries are enlarged and hyperæmic and on their surface may be seen small hæmorrhagic areas. The appearance is very characteristic, as there is marked tendency towards luteinisation, which may be noted by the presence of numerous corpora lutea.

The Aschheim-Zondek test has got certain drawbacks —

- (1) It is not always possible to have a litter of mice of the approximate age to perform this test.
- (2) Repeated injections are necessary and sometimes the mice do not stand these injections and die before the reaction is complete.
- (3) The delay of seventy two to a hundred hours may in some cases, be undesirable.

For these reasons various modifications have been tried, the most prominent of which is known as Friedman's test.

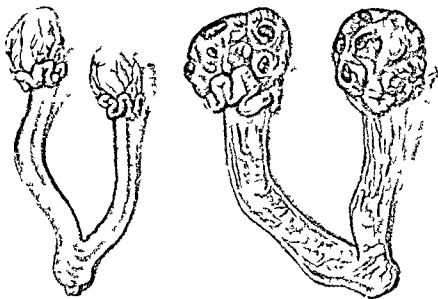


FIG. 24 —Friedman's test showing the ovaries before and after the test

Friedman's Test. This test is carried out by injecting the urine intravenously into rabbits, and has the advantage that the technique is simpler and the results can be noted at an earlier stage—thirty six to forty eight hours.

The test is done as follows. Female rabbits, aged twelve to twenty weeks, are used, which have been isolated for a period of three weeks and which are therefore non pregnant. Two injections of 6 c.c. of urine are given intravenously daily for two days, and

forty eight hours after the first injection the peritoneal cavity is opened and the ovaries inspected *in situ*. The changes noted in the ovaries are characteristic. ovulation is easily recognised, either fresh corpora lutea or projecting corpora hemorrhagica can be seen on the surface. It is essential to be certain that ovulation has not taken place recently before the test is done and that the rabbits are not pregnant. It is to ensure this that the rabbits should be kept isolated for the twenty days previously.

The Friedman's test is accurate in 98 per cent. of cases.

The Aschheim Zondek test is one of the most reliable of pregnancy tests and has given a 97 to 100 per cent. accuracy with different observers. The test is of value both from the qualitative as well as the quantitative points of view. It has been ascertained that positive results can be obtained in pregnancy of two to three weeks duration. The question of the exact time after normal parturition when the pregnancy test becomes negative has been indefinite different observers giving varying periods. An exhaustive investigation carried out by Crewe at the Pregnancy Diagnosis Station at Edinburgh has furnished some reliable data. It appears from his results that the test invariably yields a negative result ninety six hours after normal and complete parturition and he suggests that an Aschheim Zondek test undertaken on the fifth day after delivery might well be used as a reliable procedure for the diagnosis of retained living products of conception.

From the quantitative point of view the test has been utilised to diagnose the presence of hydatidiform mole and chorion epithelioma. In hydatidiform mole the chorionic villi take on extra activity and it would appear that much larger quantities of the anterior pituitary like hormone are secreted in the urine so that by suitable dilutions of the urine it has been possible to obtain a positive Aschheim Zondek reaction even after very high dilutions. The method has been applied therefore to ascertain the presence of a positive sign in dilutions of varying proportions. The certainty of the diagnosis of hydatidiform mole is increased when a positive sign is manifest even with weaker dilutions.

In the other condition which generally results after hydatidiform mole but may also occur after abortion or normal pregnancy viz chorion epithelioma the Aschheim Zondek test is of great importance. When a positive reaction is obtained some weeks after delivery or abortion the possibility of a chorion epithelioma should always be borne in mind. A positive reaction depends upon the presence of viable chorion and as long as viable chorion is attached to the uterine wall the test may be positive. In this condition also the quantitative test is of great value.

RADIOLOGICAL DIAGNOSIS OF PREGNANCY

Another method of diagnosing pregnancy is by the use of Roentgen rays. An X ray picture is of great value in diagnosing pregnancy and also in giving certain details about the pregnancy.

The diagnosis of pregnancy by means of the radiogram has been in vogue for several years, but as a radiogram of the foetus is not generally positive before the sixteenth week of pregnancy it is obvious that this method will not be of help in the early weeks. Since the Aschheim Zondek test and Friedman's test have come into use and are so accurate even in the early stages the use of the radiograph for purposes of diagnosis has receded into the background.

Pneumo-Peritoneum In this method of diagnosis air or carbon dioxide up to 500 cc is introduced into the peritoneal cavity and a radiogram of the pelvis taken. The air can be introduced by puncture of the peritoneum with a needle introduced carefully. An easier method is to introduce by a needle passed through the posterior fornix after antiseptic precautions the required quantity of air oxygen or carbon dioxide. If a skirgram is taken the outline of the uterus can be made out to be globular and the changes in the lower uterine segment which consist in an enlargement of the isthmus of the uterus in its long axis with a lateral widening can be observed. This appearance can be noted as early as the sixth or eighth week and the method may be tried in suitable cases.

Radiological examination however affords us information on many other points besides the diagnosis of pregnancy. An X ray will show —

- (1) The lie position and attitude of the foetus
- (2) Whether multiple pregnancy is present. This is one of the certain methods of diagnosing twins triplets etc during pregnancy.
- (3) Foetal abnormalities can be made out with certainty. Hydrocephalus anencephalus foetal monstrosities and malformations and double monsters can usually be diagnosed if a skirgram is taken particularly after the twenty fourth week.
- (4) Hydramnios. In this condition which is so often associated with foetal malformations or twins an X ray affords a certain method of diagnosing the position presentation and condition of the foetus as methods of abdominal palpation in view of the tenseness of the uterus are not generally serviceable.

- (5) **Period of gestation.** In some cases radiographic examination may help to determine the period of gestation. The data on which an estimate may be made about the period of gestation are (a) the size of the foetus and (b) the stage of ossification of its bones. The information available from the appearance of the epiphysial ossific centres is not reliable. Care will have to be taken therefore in assessing the age of the foetus by this method.
- (6) **Intra-uterine death of the foetus.** This is an important condition which has to be recognised, and occasionally clinical signs may not suffice to give a positive opinion as to whether the foetus is dead or alive. Overriding of the cranial bones is the chief diagnostic sign which is ascertained by the radiograph. This is sometimes known as Spalding's sign. A marked curvature of the spine, with overcrowding of the ribs, may also be noted in some cases.
- (7) **Vesicular mole.** In this condition a radiographic examination is very useful, as in conjunction with the unduly enlarged uterus a negative shadow showing no outlines of the foetal skeleton will help to clear the diagnosis. It must, however, be realised that occasionally an increase in the size of the uterus disproportionate to the period of pregnancy may be due to other causes, and not infrequently, even in the presence of a small foetus, a radiogram may be negative at a period of gestation when the foetal bones are not visible by X-rays. As this condition of vesicular mole has usually to be diagnosed in the early weeks of pregnancy, generally before the twelfth week, the radiological findings are of no value in clearing up the diagnosis.
- (8) **Extra-uterine pregnancy in the later months** may sometimes be diagnosed by means of the X-ray. The fully developed foetus may be seen in the peritoneal cavity, with the shadow of the uterus lower down, or in some cases where lipiodol is injected into the uterus, the definite shadow of the uterus can be made out distinct from the foetal shadow. In one of our cases the X-ray was very suggestive even without a preliminary lipiodol injection, from the position of the foetal skeleton to the slight shadow suggestive of the somewhat enlarged but empty uterus.

AMNIOGRAPHY

By this is meant the visualisation of the amniotic cavity by means of some opaque substance introduced into it. Amniography has been utilised more particularly in the diagnosis of placenta previa. Direct radiography of the gravid uterus gives no reliable information as to the position of the placenta. With a view to recognise the position of the placenta by radiographic examination two methods have recently been evolved in which contrast media are employed.

In the first method the limits of the amniotic cavity are demarked by the injection into it through the anterior abdominal wall of a radio opaque substance—uroselectan B. The placental site in favourable cases is demonstrated as a filling defect on the uterine wall. Amniography is the most delicate test of the position of the placenta which is available at the present moment. The recognition of the placenta depends upon (a) the unevenness of its surface and (b) its thickness. This unevenness is transferred to the line of the shadow of the amnion and affords a simple method of determining the position of the placenta. The more the placenta is curved the more accentuated does the irregularity become. Hence in cases of placenta previa where the placenta lies in the lower pole of the uterus the outline of the shadow abutting on it is greatly broken up and may be completely obliterated.

There is one serious objection however to the practical application of amniography. The injection of uroselectan B undoubtedly induces labour in about 60 per cent of cases and cannot therefore be used with any degree of safety to the mother and the foetus until the pregnancy is so far advanced that the foetus can be reasonably expected to survive its immediate delivery. Excepting for this difficulty amniography does not seem to have any adverse effect either on the mother or the foetus.

The second method of determining the presence of placenta previa is by the use of a radio-opaque solution of 12½ per cent sodium iodide injected per urethra into the bladder. When a shadowgram is taken the outline of the bladder and the foetus can be easily made out and the diagnosis is based upon the relation between the contour of the head of the foetus in cephalic presentations and the shadow of the urinary bladder which is rendered opaque by means of the injection of the contrast medium. In all cases the contour of the foetal head in the lower uterine segment is continuous with the shadow of the bladder in the last three months of normal pregnancy, whereas a free space caused by the placenta separates the foetal head from the shadow of the bladder in cases of placenta previa. This method is generally of diagnostic value if the pregnancy has gone beyond the twenty-eighth week. The

AMNIOGRAPHY

By this is meant the visualisation of the amniotic cavity by means of some opaque substance introduced into it. Amniography has been utilised more particularly in the diagnosis of placenta previa. Direct radiography of the gravid uterus gives no reliable information as to the position of the placenta. With a view to recognise the position of the placenta by radiographic examination two methods have recently been evolved in which contrast media are employed.

In the first method the limits of the amniotic cavity are demarked by the injection into it through the anterior abdominal wall of a radio-opaque substance—uroselectan B. The placental site in favourable cases is demonstrated as a filling defect on the uterine wall. Amniography is the most delicate test of the position of the placenta which is available at the present moment. The recognition of the placenta depends upon (a) the unevenness of its surface and (b) its thickness. This unevenness is transferred to the line of the shadow of the amnion and affords a simple method of determining the position of the placenta. The more the placenta is curved the more accentuated does the irregularity become. Hence in cases of placenta previa where the placenta lies in the lower pole of the uterus the outline of the shadow abutting on it is greatly broken up and may be completely obliterated.

There is one serious objection however to the practical application of amniography. The injection of uroselectan B undoubtedly induces labour in about 60 per cent of cases and cannot therefore be used with any degree of safety to the mother and the foetus until the pregnancy is so far advanced that the foetus can be reasonably expected to survive its immediate delivery. Excepting for this difficulty amniography does not seem to have any adverse effect either on the mother or the foetus.

The second method of determining the presence of placenta previa is by the use of a radio-opaque solution of 12½ per cent sodium iodide injected per urethra into the bladder. When a skigram is taken the outline of the bladder and the foetus can be easily made out and the diagnosis is based upon the relation between the contour of the head of the foetus in cephalic presentations and the shadow of the urinary bladder which is rendered opaque by means of the injection of the contrast medium. In all cases the contour of the foetal head in the lower uterine segment is continuous with the shadow of the bladder in the last three months of normal pregnancy, whereas a free space caused by the placenta separates the foetal head from the shadow of the bladder in cases of placenta previa. This method is generally of diagnostic value if the pregnancy has gone beyond the twenty eighth week. The

- (5) **Period of gestation** In some cases radiographic examination may help to determine the period of gestation. The data on which an estimate may be made about the period of gestation are (a) the size of the foetus and (b) the stage of ossification of its bones. The information available from the appearance of the epiphyseal ossific centres is not reliable. Care will have to be taken therefore in assessing the age of the foetus by this method.
- (6) **Intra uterine death of the foetus** This is an important condition which has to be recognised, and occasionally clinical signs may not suffice to give a positive opinion as to whether the foetus is dead or alive. Overriding of the cranial bones is the chief diagnostic sign which is ascertained by the radiograph. This is sometimes known as Spalding's sign. A marked curvature of the spine, with overcrowding of the ribs, may also be noted in some cases.
- (7) **Vesicular mole** In this condition a radiographic examination is very useful, as in conjunction with the unduly enlarged uterus a negative shadow showing no outlines of the foetal skeleton will help to clear the diagnosis. It must however, be realised that occasionally an increase in the size of the uterus disproportionate to the period of pregnancy may be due to other causes, and not infrequently, even in the presence of a small foetus, a radiogram may be negative at a period of gestation when the foetal bones are not visible by X rays. As this condition of vesicular mole has usually to be diagnosed in the early weeks of pregnancy, generally before the twelfth week, the radiological findings are of no value in clearing up the diagnosis.
- (8) **Extra uterine pregnancy in the later months** may sometimes be diagnosed by means of the X ray. The fully developed foetus may be seen in the peritoneal cavity, with the shadow of the uterus lower down or in some cases where lipiodol is injected into the uterus, the definite shadow of the uterus can be made out distinct from the foetal shadow. In one of our cases the X ray was very suggestive even without a preliminary lipiodol injection from the position of the foetal skeleton to the slight shadow suggestive of the somewhat enlarged but empty uterus.

AMNIOGRAPHY

By this is meant the visualisation of the amniotic cavity by means of some opaque substance introduced into it. Amniography has been utilised more particularly in the diagnosis of placenta prævia. Direct radiography of the gravid uterus gives no reliable information as to the position of the placenta. With a view to recognise the position of the placenta by radiographic examination two methods have recently been evolved in which contrast media are employed.

In the first method the limits of the amniotic cavity are demarcated by the injection into it through the anterior abdominal wall of a radio opaque substance—uroselectan B. The placental site in favourable cases is demonstrated as a filling defect on the uterine wall. Amniography is the most delicate test of the position of the placenta which is available at the present moment. The recognition of the placenta depends upon (a) the unevenness of its surface and (b) its thickness. This unevenness is transferred to the line of the shadow of the amnion and affords a simple method of determining the position of the placenta. The more the placenta is curved the more accentuated does the irregularity become. Hence in cases of placenta prævia where the placenta lies in the lower pole of the uterus the outline of the shadow abutting on it is greatly broken up and may be completely obliterated.

There is one serious objection however to the practical application of amniography. The injection of uroselectan B undoubtedly induces labour in about 60 per cent of cases and cannot therefore be used with any degree of safety to the mother and the foetus until the pregnancy is so far advanced that the foetus can be reasonably expected to survive its immediate delivery. Excepting for this difficulty amniography does not seem to have any adverse effect either on the mother or the foetus.

The second method of determining the presence of placenta prævia is by the use of a radio opaque solution of 12½ per cent sodium iodide injected per urethra into the bladder. When a skiagram is taken the outline of the bladder and the foetus can be easily made out and the diagnosis is based upon the relation between the contour of the head of the foetus in cephalic presentations and the shadow of the urinary bladder which is rendered opaque by means of the injection of the contrast medium. In all cases the contour of the foetal head in the lower uterine segment is continuous with the shadow of the bladder in the last three months of normal pregnancy whereas a free space caused by the placenta separates the foetal head from the shadow of the bladder in cases of placenta prævia. This method is generally of diagnostic value if the pregnancy has gone beyond the twenty-eighth week. The

space between the contour of the foetal head and the shadow of the bladder should be more than 1 cm in width at least to have diagnostic significance. Separation of the cephalic and vesical shadows by a placenta prævia takes place regardless of the point of insertion of the latter on the anterior or posterior aspect of the lower uterine segment. The method has no value in the differential diagnosis of grave detachments of normally inserted placenta and in placenta prævia if the foetus is not presenting by the cephalic pole.

PELVIMETRY AND CEPHALOMETRY

A number of devices have been suggested to estimate accurately the type of the pelvis and the measurements of the different diameters of the pelvis in its varying planes. It is well however, to remember that there are limitations to the interpretation of radiological pelvimetry and that while the obstetrician can get some very useful hints from this method it is necessary to realise that overemphasis of conclusions arrived at is not yet warranted.

The radiograms are taken in the supine, prone and lateral positions and are of considerable help. The pelvis is only one of the three factors concerned in the mechanism of delivery and what really matters in the management of the case is not so much the size of the pelvis as the degree if any, of cephalo pelvic disproportion. This can only be judged in the last weeks of pregnancy or in some cases when the patient actually is in labour. The third factor, namely the extent to which the forces of labour may help in correcting minor degrees of deflexion attitude and in overcoming disproportion cannot be estimated till the woman is actually in labour. In spite of these drawbacks radio pelvimetry has a definite place and should be resorted to in all cases where any doubt is present as to the type of the pelvis. In primigravidae it is invaluable and in cases of pelvic deformity valuable help is obtained by a study of the radiograph.

Cephalometry By this the size of the foetal head the presence of undue ossification the degree of flexion and the extent of disproportion between the pelvis and the foetal head if any, may be observed.

Thus it will be seen that radiological methods form a valuable aid to accurate methods of obstetric diagnosis, but it must be emphasised that the chief reliance must still continue to be placed upon the old and well tried clinical methods of diagnosis namely, inspection palpation and auscultation and that it will be unsafe to leave these and to seek the aid of the roentgenologist alone in foretelling the course and arranging for the proper conduct of labour.

CHAPTER VIII

THE FŒTUS IN NORMAL PREGNANCY

THE fœtus or the passenger is one of the important factors concerned in labour and it is necessary to appreciate correctly the part played by it in the mechanism of labour

Attitude The attitude of the fœtus is the relation of the fœtal parts to one another. Ordinarily the fœtus assumes the attitude of universal flexion thus forming an ovoid mass corresponding roughly to the shape of the uterine ovoid. By this means the space occupied by the fœtus is reduced to the minimum and it will be seen later that this attitude of universal flexion has an important bearing upon the mechanism of delivery. The spinal column is bent forward the head is flexed the chin resting against the sternum the arms are flexed and folded across the chest the lower extremities are flexed so that the thighs are on the abdomen and the legs bent at the knee joint resting on the thighs with the feet crossed in an attitude of dorsi flexion.

When the fœtal ovoid in this attitude of universal flexion corresponds in its longitudinal diameter to the uterine ovoid the uterus is subjected to very little stretching and in such a position the fœtus may either have the cephalic part or the breech at the lower pole of the uterus.

Presentation By presentation is meant that portion of the fœtal ovoid which is in relation to the lower pole of the uterus and is the first to attempt to engage in the pelvis when labour starts. The *presenting part* will be that portion of the fœtal ovoid in the presentation which lies lowest and is felt on a vaginal examination when labour has been in progress for some time. Thus the fœtus may present either by the cephalic pole or by the podalic pole and we speak of *cephalic presentations* and *podalic presentations*. It may sometimes also lie transversely giving rise to a *shoulder presentation*. When it presents as a cephalic presentation there may be many parts of the cephalic pole which may lie lowest and the presenting part may therefore vary. Thus depending upon the degree of flexion of the cephalic pole we may have the vertex brow glabella face etc. as the presenting part.

The Lie of the Fœtus We speak of two lies—the longitudinal lie and the oblique or transverse lie. This refers to the relation between the longitudinal axis of the fœtal ovoid and the longitudinal axis of the uterine ovoid. The longitudinal axis of the fœtal ovoid is the cephalo podalic axis. When this axis of the fœtal ovoid corresponds to the longitudinal axis of the uterine ovoid the lie is said to be a *longitudinal lie*. When however the longitudinal

axis of the fœtus is either oblique or transverse to that of the uterine ovoid the lie is said to be an *oblique* or *transverse lie*

Position By this term is understood the relation of the fœtus to the maternal pelvis. It is expressed in terms of the

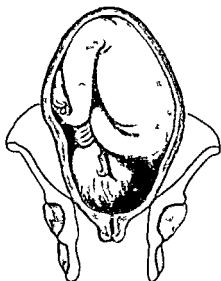


FIG. 5.—Vertex presentation—first position—LOA

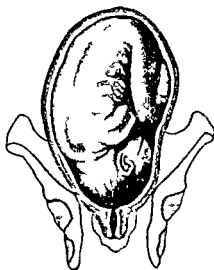


FIG. 6.—Vertex presentation—second position—ROA

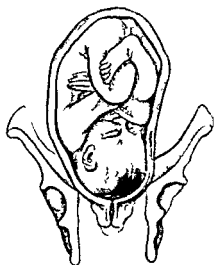


FIG. 7.—Vertex presentation—third position—ROP

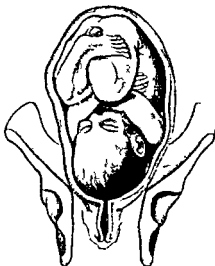


FIG. 8.—Vertex presentation—fourth position—LOP

position of an arbitrarily chosen part of the fœtus to the four quadrants of the maternal pelvis. In the different presentations a particular landmark generally a bony landmark is chosen and called the denominator and depending upon its position with

reference to the four quadrants in the pelvic cavity the position of the fœtus *in utero* is determined. The four quadrants in any plane of the pelvic canal may be divided into the two right quadrants and the two left quadrants—these being the right anterior and right posterior the left anterior and left posterior. The landmarks chosen as the denominators vary with the particular presenting part.

In cephalic presentation when the vertex presents the denominator is the *occiput*. When the *face* presents the denominator is the *chin* or *mentum*. When the *brow* presents the *frontal eminence* is the denominator. In *pelvic presentations* the denominator is the *sacrum*, and in *shoulder presentations* the denominator is the *acromion*.

Besides these four positions there are two others—the right lateral and left lateral—so that six positions may be described with reference to the denominator and the maternal pelvis —

Left anterior	Right anterior
Left lateral	Right lateral
Left posterior	Right posterior

Taking, therefore the different presentations the following positions are possible —

Cephalic Presentations

(1) *Vertex* with the occiput as the denominator —

Left occipito anterior	(L O A)
Left occipito lateral	(L O L)
Left occipito posterior	(L O P)
Right occipito posterior	(R O P)
Right occipito lateral	(R O L)
Right occipito anterior	(R O A)

(2) *Face* with the chin or mentum as the denominator —

Right mento posterior	(R M P)
Right mento lateral	(R M L)
Right mento anterior	(R M A)
Left mento anterior	(L M A)
Left mento lateral	(L M L)
Left mento posterior	(L M P)

(3) *Brow* with the brow or the frontal eminence as the denominator

Although theoretically the same six positions may be possible it is usual to recognise for clinical purposes only two positions —

- (i) The brow to the right and
- (ii) The brow to the left

This is due to the fact that in brow presentation the diameter of engagement which is the longest diameter of the foetal skull can engage only in the transverse diameter the longest diameter at the brim

Podalic or pelvic or breech presentations with the sacrum as the denominator —

Left sacro anterior	(L S A)
Left sacro lateral	(L S L)
Left sacro posterior	(I S P)
Right sacro posterior	(R S P)
Right sacro lateral	(R S L)
Right sacro anterior	(R S A)

Shoulder Presentations Here the acromion is usually the denominator and four positions are possible —

Left acromio anterior	(L A A)
Left acromio posterior	(L A P)
Right acromio posterior	(R A P)
Right acromio anterior	(R A A)

So far as oblique lies are concerned it may be stated that there are two possibilities. The cephalic pole may be the more dependent in any of these positions. On the other hand the podalic pole may be the more dependent with the cephalic pole on the opposite side and above. In the majority of cases in this latter category the chances are that the breech will slip into the pelvic brim at the time of labour and thus one form of spontaneous version may take place.

Compound Presentations Here more than one part of the foetus will be found presenting.

The Foetal Head and its Diameters The passage of the foetal head through the maternal pelvis forms the most important event in the delivery of the child. A careful study of the foetal head is therefore essential to appreciate the part that it plays in the mechanism of labour and the difficulties that may arise in the course of delivery (Fig 13 page 25)

The foetal skull consists of the vault the base and the face. The vault of the skull is the portion above which is subject to some degree of compression. The bones that go to form the vault of the skull are the two frontal bones the two parietal bones the occipital bone the two temporal bones and the wings of the sphenoid. These bones are not firmly united together by bony union and in between two bones is a thin piece of membrane which is spoken of as a *suture*. Where two or more sutures meet there is a wider expanse of membranes which is spoken of as a *fontanelle*.

Thus we have —

- (1) The *frontal suture*, situated between the two frontal bones
- (2) The *sagittal suture*, situated between the two parietal bones
- (3) The *coronal suture*, situated between the frontal and parietal bones
- (4) The *lambdoidal suture* situated between the posterior margins of the parietal bones and the occipital bone
- (5) The *temporal suture* situated between the inferior margin of the parietal bone on either side and the upper margin of the temporal bone of the corresponding side

When the cephalic pole of the foetus presents one or other of the sutures can be felt except the temporal suture. The direction in which the sagittal suture is felt in the maternal pelvis and its relative position with reference to the oblique or transverse diameters of the pelvis are of importance and form a valuable guide in determining the nature and extent of abnormality if any in the position of the fetal head.

There are four fontanelles which can be made out —

(a) The *anterior fontanelle* or *bregma* is a lozenge shaped space situated at the junction of the sagittal and coronal sutures. Four bones can be felt at its edges—the two parietal bones on either side posteriorly and the two frontal bones in front. Three sutures are seen radiating from its centre—the sagittal the coronal and the frontal. The anterior fontanelle can sometimes be felt during labour in cephalic presentations.

(b) The *posterior fontanelle* is a smaller triangular area situated posteriorly at the junction of the sagittal and lambdoidal sutures. Three bones can be felt at the margins—the two parietal bones and the occipital bone and its position with reference to the maternal pelvis forms an important landmark in differentiating the different positions of a vertex presentation.

(c) The *temporal* or *Gasserian fontanelle* is situated at the junction of the lambdoidal and temporal sutures.

(d) Occasionally a lozenge shaped space smaller than the bregma is found in the sagittal suture midway between the anterior and posterior fontanelle. This is sometimes spoken of as the *sagittal fontanelle*. It is not however a true fontanelle as it is not the result of the meeting of two or more sutures but is due to faulty ossification. It is of some clinical significance as it may be mistaken for the anterior fontanelle. Such a mistake should not arise if the fontanelle be carefully palpated and the sutures that should radiate and the bones that should meet are remembered.

DIAMETERS OF THE FŒTAL SKULL

Certain diameters of the foetal skull are important to note, as they give an idea of the shape and size of the foetal skull and an approximate measurement of the circumference. The diameters of the foetal skull commonly taken into consideration are —

(1) The *suboccipito-bregmatic*. This measures $3\frac{1}{2}$ ins (9.4 cm) and is the distance between the middle of the anterior fontanelle and a point just below the occipital protuberance. This is the diameter of engagement in a *vertex presentation*. The circumference of the foetal head at this plane measures 11 ins (27.5 cm).

(2) The *ceruico-bregmatic* or *submento-bregmatic diameter* is the distance between the middle of the anterior fontanelle and a point that represents the junction of the chin and neck. It measures $3\frac{1}{2}$ ins (9.4 cm) and is the diameter of engagement in a *face presentation*.

(3) The *occipito frontal* diameter is the distance between the root of the nose or glabella and the most prominent point on the occipital protuberance. It measures $4\frac{1}{2}$ ins (11.25 cm) and is the diameter which tries to engage when the head is in an attitude of deflexion in a *vertex presentation*. The circumference measures at this plane $13\frac{1}{2}$ ins (34 cm).

(4) The *vertical mental* or *occipito mental* is the distance between the tip of the mentum or chin and the most distant point of the occipital bone. This is the longest diameter of the foetal skull, measuring $5\frac{1}{2}$ ins (13 cm), and is the diameter of engagement in a *brow presentation*. The circumference around this diameter measures 15 ins (37.5 cm).

(5) The *biparietal diameter* is the widest apart distance between the two parietal eminences. It measures $3\frac{1}{2}$ ins (9.4 cm).

(6) The *bitemporal diameter* is the widest apart distance between the two temporal bones. This measures $3\frac{1}{2}$ ins (8 cm).

It is well to remember that the foetal head is capable of moulding during labour. This is possible because of the membranous union between the bones of the vault of the skull. Consequently, overlapping of the bones occurs and the diameters become slightly shortened and the circumference diminished in size.

The base of the skull is made up of several bones united by firm bony union and cannot therefore be diminished in size.

The face is likewise made of bones united firmly and is incapable of compression. Occasionally the skull is unduly ossified, and when the foetus is over mature, i.e. it has passed beyond the normal period of pregnancy *in utero* the sutures are not so wide and the extent of moulding is considerably diminished. Under such circumstances greater difficulty is experienced in the delivery of the foetal head, unless the maternal pelvis is proportionately roomy.

FREQUENCY OF THE PRESENTATIONS AND POSITIONS

It has been found that vertex presentations preponderate and occur in nearly 96 per cent of the cases, whereas pelvic presentations occur in less than 3 per cent face 0.5 per cent and shoulder about 0.5 per cent

Amongst the vertex presentations the position that is most commonly adopted by the foetus is the left occipito anterior fully 70 per cent coming under this category. The group next in frequency is the right occipito posterior position occurring in over 25 per cent of the cases. The rest of the cases are either left occipito posterior or right occipito anterior.

It must, however, be realised that the position is likely to change during the course of labour—that ordinarily early in labour one may meet with an occipito posterior position but as labour progresses the position changes very often to an occipito lateral and finally to an occipito anterior position. It is on account of this factor that some confusion arises as to what exactly the position of the foetus was at the time the patient went into labour.

Causes which influence the Frequency of a Cephalic Presentation. Several theories have been put forward to account for the preponderance of cephalic presentations particularly vertex. There are two factors which are probably responsible: (1) The effect of gravity and (2) the necessary adjustment between the foetal ovoid and the uterine ovoid so as to allow for the most comfortable position for the growing foetus.

Gravity has been realised for some time to be one factor concerned in the production of cephalic presentations at term. It will be seen that when labour occurs prematurely the frequency of abnormal presentations is much greater. It is also known that where the foetus is dead, podalic presentations occur not infrequently. It has therefore been suggested that in the later weeks of pregnancy because the head is the heaviest portion of the foetal ovoid gravity would help to bring it to the lower uterine pole. On the other hand the persistent tendency for the foetal ovoid to accommodate itself to the uterine ovoid is better exemplified by the preponderance of podalic presentations when the foetus is dead. The foetus *in utero* is generally active and moving and tends to adapt the foetal ovoid to the uterine ovoid so as to ensure a comfortable position. In the early months there is enough space and the liquor amnii is sufficiently in excess as compared to the size of the foetus to allow of free movement but in the later weeks the growing size of the foetal ovoid makes it more difficult for the foetus to move so freely, and consequently the movements of the foetus help to restrict the position to the most comfortable one that can be adopted within the uterine ovoid.

Among the causes of abnormal presentations and positions may therefore be mentioned prematurity, variations of the uterine ovoid such as occur when the uterus is overdistended as from hydramnios or twins, also a flaccid uterus with a lax abdominal wall as in multipare, when there is not the same necessity for adjustment of the fœtal ovoid to the uterine ovoid, abnormalities in regard to the fœtus itself would naturally interfere with the adjustability and account for variations. Contracted pelves, tumours of the lower uterine segment, placenta previa are all factors which interfere with the natural adjustment of the fœtal ovoid to the uterus and therefore give rise to anomalies in position and presentation

METHODS OF OBSTETRIC DIAGNOSIS

The methods of obstetric diagnosis available are —

- (1) Inspection
- (2) Abdominal palpation
- (3) Auscultation
- (4) Vaginal examination or bimanual examination
- (5) Rectal examination
- (6) Radiography

It is a time honoured practice to resort to abdominal palpation and auscultation for the diagnosis of the presentation and position of the fœtus and except in cases where considerable difficulty is found it is not justifiable to resort to a vaginal examination. Radiography helps to an easy recognition of the presentation and position but it is to be hoped that these modern methods of easy diagnosis will not be used to the exclusion of the older methods as the obstetrician must still rely on obstetric palpation for a complete diagnosis

(1) **Inspection** This is useful and must never be omitted. Inspection will note whether the uterine ovoid is longitudinal, oblique or transverse thus suggesting a shoulder presentation, or whether there is overdistension as in cases of hydramnios or twins. Occasionally the presence of tumours may be noted on inspection.

(2) **Abdominal Palpation** This must be done systematically with the patient lying on her back and the legs flexed. The height of the fundus should first be noted, as it gives generally a fairly approximate idea as to the period of pregnancy. With the abdomen laid bare from the ensiform cartilage to a little below the symphysis pubis the obstetrician should proceed to palpate, facing the patient. The palms should be laid gently, one on either side, taking care to see that they are not too cold so as to provoke

contraction of the abdominal or uterine muscles and thus prevent effective palpation

After outlining the contour of the uterus and noting the height of the fundus the first manœuvre is to determine the part of the fœtus at the fundus. This is known as the *fundal grip* and if the palms are kept on either side of the fundus and gently palpated it will be possible to note whether the podalic or the cephalic pole is situated here the head being generally harder more round and more freely movable and ballotable

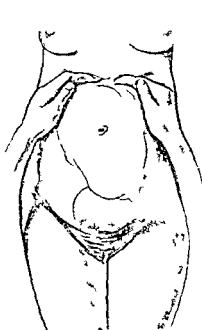


FIG. 29. Methods of abdominal palpation—fundal grip

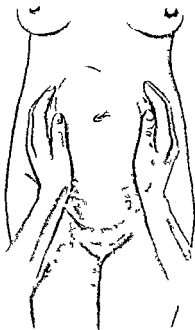


FIG. 30.—Methods of abdominal palpation—abdominal grip

The *second grip* or the *umbilical grip*. Having determined which pole of the fœtus is situated at the fundus the examiner places the palmar aspects of the hands on either side of the umbilicus and gently palpates. On one side he will generally feel a hard, resistant plane, probably slightly curved, which is the back, on the other side a number of nodules will be felt which are the limbs. In some cases these nodules may be felt on both sides of the umbilicus. This indicates a posterior position that is one where the back is situated posteriorly and the limbs are anterior

The third and fourth grips are very important as they give many valuable data for obstetric diagnosis

The *third grip* is spoken of as the *Pawlik's grip*. The examiner grasps the lower portion of the abdomen just above the symphysis pubis between the thumb and fingers of one hand and by gently pressing the part enclosed between, finds out which part of the foetus is presenting. If the cephalic pole is presenting this will be felt as a hard, round mass which if not engaged in the pelvic brim may ballot independently of the foetal body. On the other hand if the breech is presenting it will be found to be much larger in size, without any bony landmarks and only moves with the rest of the body. If the head is felt a careful palpation may elicit



FIG. 31.—Methods of abdominal palpation—Pawlik's or the first pelvic grip

the bony landmarks namely, the occiput and the sinciput, and depending upon the relative positions of the occiput and the sinciput with reference to the maternal pelvis, it is possible to determine whether in the cephalic pole it is the vertex that is presenting or the brow or the face. If the sinciput is at a higher level than the occiput the vertex is presenting, if the sinciput and the occiput are on the same level the brow is presenting, if the sinciput on the other hand is on a lower level than the occiput the face is presenting.

The *fourth grip* or the *second pelvic grip*. This is very useful, not only to confirm the findings of Pawlik's grip but also to determine other points of obstetric importance. In this grip the

examiner faces the patient's feet, and with the tips of the fingers of each hand, makes deep pressure in the direction of the pelvic brim. Care should be taken to see that the abdominal muscles are entirely relaxed, that the thighs are semi flexed, and the fingers on either side should be dipped deep down with a view to get more intimately in touch with the presenting part of the fetus. On a careful palpation, if the head is presenting it will be seen that the fingers of one hand get into touch with the occiput and those of the other hand with the sacrum. The relative positions of these two bony landmarks in the different presentations have already been referred to.

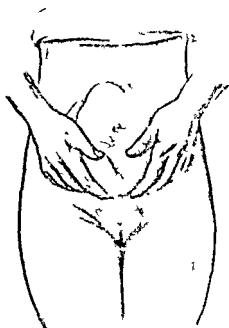


FIG. 32. Methods of abdominal palpation—second pelvic grip.

But more important information is available by this grip. In the first place it is possible to recognise if the presenting part has descended into the pelvis and if so how far. Secondly it is possible to make out whether there is any disproportion between the presenting part and the brim of the pelvis.

The second pelvic grip therefore, enables us to recognise—

(1) Whether the cephalic or the podalic pole is presenting, or whether it is a transverse or an oblique lie.

(2) If it is a cephalic presentation whether it is the vertex, face or brow that is presenting.

(3) If the presenting part has entered the brim of the pelvis and during labour, trace its descent.

(4) The presence of disproportion if any between the presenting part and the pelvis

It is most valuable for purposes of obstetric diagnosis. So valuable is it that we have for some time given up the practice of palpating in the order above mentioned. We start with the second pelvic grip first, our object being to prevent stimulation of the abdominal muscles which occasionally happens during the routine palpatory method suggested above. If the abdominal muscles are fairly lax the second pelvic grip will help us to recognise in the majority of instances along with Pawlik's grip if necessary

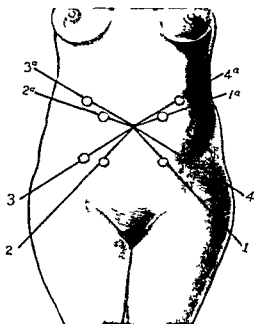


FIG. 33 Position of foetal heart in the various positions of vertex and breech presentations

the exact presentation position disproportion if any and progress in labour

(3) **Auscultation** This helps us to diagnose whether the foetus is alive and by a careful recognition of the point of maximum intensity of the foetal heart sounds to locate also the position of the foetus. Many other subsidiary sounds that are heard by auscultation have been referred to elsewhere. It may be mentioned as a general rule that the point of maximum intensity of the foetal heart sound is below the umbilicus in all cephalic presentations above the umbilicus in podalic presentations and almost on a level with the umbilicus in oblique or transverse lies. The position also varies with reference to the position of the back of the fetus. In cases where the back is to the left or right the foetal heart

sounds are heard on the same side nearer the middle line in anterior positions and further away in posterior positions.

(4) **Vaginal Examination** Vaginal examination is not generally useful during the course of pregnancy except that occasionally by internal ballotment pregnancy can be diagnosed and in some cases by palpating through one or other fornix it may be possible to know whether the cephalic pole is the most dependent part or not.

A single vaginal examination is permissible in the latter half of pregnancy to ascertain the presence of any abnormalities either of the soft parts or of the bony pelvis.

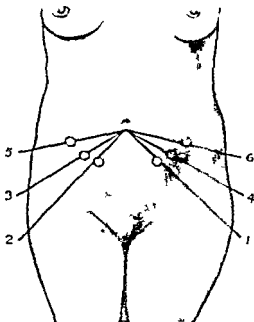


FIG. 74.—1 to 6: (1) fetal head in the pelvic inlet; (2) fetal head in the pelvic outlet; (3) fetal head in the pelvic outlet; (4) fetal head in the pelvic outlet; (5) fetal head in the pelvic outlet; (6) fetal head in the pelvic outlet.

Ordinarily a vaginal examination should not be necessary in the course of labour. The danger of introducing infection no matter how careful one may be in making such an examination necessarily restricts its adoption as a routine method of obstetric diagnosis. In some cases however it is inevitable that a vaginal examination should supplement other methods of obstetric diagnosis to get a correct appreciation of the presentation and position and sometimes the stage of labour. It is more useful in some cases of prolonged labour when the uterus is tonically contracted or in cases where the uterus is overdistended as in hydramnios than abdominal examination or where the progress of labour cannot be judged unless a vaginal examination is made. The appropriate

preparation for vaginal examination has been dealt with in another chapter (VII) and the information that could be gathered has also been detailed. A vaginal examination has its uses but should be done with extreme caution.

(5) **Rectal Examination** The danger incidental to vaginal examination namely the possibility of sepsis has made it desirable occasionally to resort to rectal examination. We do not share the same optimism as some others about the comparative safety of rectal examination.

(6) **Radiography** This is a very valuable diagnostic aid and should be resorted to in doubtful cases. In cases of hydramnios, twin pregnancy in women with fat abdominal walls and in cases complicated with tumours it is a useful method of diagnosis.

The part played by radiography in the diagnosis of obstetric conditions is referred to in the previous chapter.

CHAPTER IX

ANTENATAL CARE

THE subject of antenatal care has been receiving increasing attention in recent years and is an important advance in obstetrics. Realisation that the proper care of the mother begins from the time pregnancy is diagnosed has resulted in a material reduction in maternal and foetal mortality and morbidity. In fact in some countries this has been so thoroughly realised that a compulsory notification of pregnancy is required by law to enable civic authorities to take such measures as may be necessary to look after the expectant mothers. It is often thought that antenatal care is necessary only in the latter half of pregnancy but serious abnormalities may occur in the earlier period of pregnancy and we would emphasise that a woman as soon as she suspects the possibility of pregnancy should consult an obstetrician or attend an antenatal clinic.

ANTENATAL CARE IN THE FIRST HALF OF PREGNANCY

During this period certain particulars ought to be noted. The first essential is to diagnose the existence of pregnancy as not infrequently women with varying periods of amenorrhœa may imagine that they are pregnant and seek antenatal advice or confirmation of the fact of pregnancy.

The second thing to note is whether pregnancy is intra uterine or extra uterine. Comparatively rare as the condition of extra uterine pregnancy is it should however be realised that great

harm may result from overlooking this, and if a routine examination were made in every case between the sixth and eighth weeks of pregnancy, extra uterine gestation might be diagnosed before any of the serious catastrophes could occur

It is also necessary to diagnose whether in cases of intra uterine pregnancy, the pregnancy is proceeding in a normal manner. Thus, the possibility of a vesicular mole, a retroverted gravid uterus, a tendency to sacculation of the uterus, angular pregnancy, pregnancy complicated with tumours may all be diagnosed in the early half of pregnancy and suitable measures adopted.

Certain so called physiological changes of pregnancy may tend to become pathological. Thus it is not infrequent that "morning sickness" may become exaggerated and may take on the form known as "hyperemesis gravidarum". In cases where pregnancy occurs in women suffering from heart disease, tuberculosis, etc., the question may have to be decided at an early stage of pregnancy, whether the condition is such as to permit the pregnancy to continue, or whether measures may not be necessary to terminate pregnancy. Syphilis is another of those complications where it is most desirable to take early measures to treat the condition with a view to save the foetus. Not infrequently abortion or miscarriage may occur in the first half of pregnancy as a result of the syphilitic virus infecting the foetus and placenta.

Apart from all these pathological conditions it is desirable especially in a primigravida to offer some advice as to the regulation of her activities. Young women unaccustomed to any particular restraint may not realise that during pregnancy there are certain inevitable limitations to exercise, proper regulation of diet, sleep, bathing, care of the bowels, etc. and it should be the duty of the obstetrician at this period to offer them this advice.

It will therefore be seen that a routine examination of all pregnant women as early as possible is of great advantage and will obviously aid in the early detection of abnormalities and permit of their suitable treatment at once.

ANTENATAL CARE IN THE LATTER HALF OF PREGNANCY

Usually, antenatal advice is more often sought in the latter half of pregnancy. It is important to realise that if antenatal care is to be effective it should not be restricted to an occasional visit to the clinic, but that the patient should be kept constantly under observation and should be treated in an institution if any signs or symptoms of threatening complications appear. It is our rule to insist upon the expectant mother attending the antenatal consultation room at least once a month from the twentieth week

onwards and after the thirty-second week once a fortnight provided there are no untoward complications to report. In the last weeks of pregnancy we prefer her coming once a week. In spite of all this care accidents occasionally occur to which we shall refer later.

The advantages of systematic examination in the latter half of pregnancy are —

(1) A routine general examination of the patient will furnish evidence of any abnormalities in any of the systems which may need attention. In the absence of such abnormalities both the obstetrician and the patient feel a sense of security that possibly no complications may arise. From the patient's point of view it relieves her of anxiety and keeps her in a proper frame of mind and so enables her more easily to go through pregnancy and stand the strain of labour. We cannot overemphasise the fact that it is of the utmost importance to gain the confidence of the patient and make her feel that she is progressing normally and is in safe hands.

(2) A full record of her history with careful pelvimetry and a proper appreciation of the presentation and position of the foetus enable the obstetrician to correct any abnormalities and to be better prepared to manage the case during labour. Nothing is more distracting than to find surprises once labour has begun. Further such complications may only be recognised at a stage in labour when it is too late to think of certain remedies and of necessity other measures risky to the mother or to the foetus may have to be adopted.

(3) The routine examination of the urine of the blood pressure weight etc. will help one to determine whether the patient is developing any form of toxæmia and whether the much dreaded complication of eclampsia may appear.

(4) The proper diagnosis of venereal diseases and their treatment are absolutely essential in the interests of the foetus as well as the mother.

(5) A thorough hæmatological examination enables us to deal with the patient in such a manner that her health is not undermined and that the foetus develops properly and is born without complications.

We shall now consider the routine examination that ought to be made at an antenatal clinic when the expectant mother presents herself let us say at the twenty fourth week of pregnancy.

History This is most important. It consists of—

- (a) History of childhood
- (b) History of previous pregnancies and labours
- (c) History of present pregnancy

The *history of childhood* is important as it may furnish the obstetrician with information as to the possibility of certain adverse factors in childhood affecting the pregnant woman. Among these factors rickets is the most important. This affects the development of the pelvis and leads to various deformities which are dealt with at length in a later chapter and should therefore suggest a careful investigation of the pelvis.

History of injuries of any infectious fevers such as anterior poliomyelitis leading to paralysis of one or other of the limbs acute rheumatic fever leading to cardiac sequelæ etc furnish valuable indications for further investigation.

History of Previous Pregnancies and Labours This should always be obtained in a multipara. The number of children that have been born the nature of the deliveries and the complications if any should be noted. In cases where the children are born alive the fact should also be ascertained whether they continued to live or whether they died in the neonatal period. Not infrequently a history of live birth followed by neonatal death suggests the possibility of some form of obstructed labour not necessarily sufficient to require artificial aid but sufficient to endanger the possibilities of safe delivery through the natural passages. When a history of live birth is given care must be taken to see whether the child was born prematurely and in all cases where the weight of the child can be ascertained it is useful to get the information. We have had cases where a woman has given a history of one or two deliveries with children born alive and which continued to live while in the third or subsequent delivery there has been great difficulty in labour. On closer investigation it was found that the earlier pregnancies ended prematurely and the children weighed less than 5 lbs while in the last pregnancy it was a full term baby weighing 7 to 8 lbs and this explained the difficulty.

In cases where the delivery has been assisted a careful investigation may reveal the nature of the difficulty and the type of assistance that was necessitated. We have made it a rule that in every case where artificial assistance has been given the patient should be furnished with a note giving the exact particulars of the delivery with the opinion of the attendant obstetrician as to the cause of delay the nature of artificial aid given with a suggestion as to the possible mode of delivery in subsequent pregnancies. We consider it is the duty of every obstetrician to furnish this information to the patient and ask her to show it to the next obstetric attendant should the necessity arise. For example not infrequently we have advised that a subsequent delivery at term should be by Cæsarean section having just experienced the difficulties of a vaginal delivery of a full time child.

History of Present Pregnancy This should always be elicited carefully both in multiparæ and primiparæ. A history of excessive vomiting or of any other complications in the earlier part of pregnancy such as malaria influenza etc. would be of help in ascertaining the exact condition of the patient and the possibility of further complications occurring. A history of pyelitis of repeated attacks of slight hæmorrhage of threatened abortion of headaches œdema or dimness of vision should all be noted.

General Examination Having ascertained the history of the patient the next step is a thorough general examination. All the systems should be carefully examined—the circulatory respiratory urinary and nervous systems. The urine should be examined as a matter of routine particularly for albumin. The total quantity of urine passed may have to be ascertained in some cases. The presence of sugar may also be noted especially if the specific gravity is high. We make it a rule that the patient should get her urine examined at least once a fortnight between the twenty fourth and thirty second weeks and once a week thereafter. In spite of this we have noted not infrequently the sudden appearance of albuminuria. In some cases diminution in the quantity of urine may be noted and the patient should be advised as to the possible signs and symptoms she will have to note to seek immediate medical advice.

Hæmatological Examination We advocate a thorough hæmatological examination particularly in the tropics as a matter of routine in every woman attending an antenatal clinic. So frequent is the incidence of anæmia and so serious may the results be of any neglect of this condition that we think that it is wise to insist on a hæmatological examination being made. This should include the following —

- (a) Estimation of the hæmoglobin percentage
- (b) Estimation of the total number of leucocytes and red blood corpuscles
- (c) A differential count of the leucocytes if necessary
- (d) When any definite evidence of anæmia is present that is when the hæmoglobin percentage is less than 80 a more detailed examination of the blood should be made on the lines suggested in the chapter on Anæmias complicating Pregnancy

Examination of the motions for the presence of ova of hook worms round worms etc. is also an invariable necessity in the tropics especially if anæmia is noted.

Serological Tests It is best as a matter of routine to send the blood for Wassermann and Kahn tests as in many cases one finds evidence of syphilis although clinically it may not be so

obvious From the point of view of the foetus it is of the utmost importance that this fact should be ascertained as early as possible to enable proper antyphibitic treatment to be adopted

Weight The weight of the pregnant mother should be taken periodically It is now known that any rapid increase in weight is due to occult oedema which is likely to be associated with a severe form of toxæmia The total increase in the weight of a pregnant woman should not exceed 20 lbs and the increase in weight in any month should ordinarily not exceed 5 lbs

Blood-Pressure This is invariably taken and we advise that both the systolic and diastolic pressures be noted on every occasion the patient attends the antenatal clinic Hypertension is a complication of bad prognostic significance Every case of hypertension must be thoroughly investigated to see if there is an underlying toxic factor Even in the condition known as essential hypertension care should be taken that the patient's diet is regulated that she gets sufficient rest and that the hypertension is not allowed to persist for a long period The normal blood pressure may vary between 110 and 120 mm systolic Anything over 140 mm is suggestive of some form of toxæmia and if the systolic be above 160 mm the patient should preferably be hospitalised and treated We do not think it desirable that any patient with a systolic pressure of above 160 mm should be treated in an antenatal clinic as an out patient Even in the absence of albumin in the urine it is very necessary that she should be promptly taken in hand kept at rest dietetic restrictions imposed bowels thoroughly moved and periodic blood pressure records maintained We know of several cases where albuminuria has occurred after the first fit and we know of cases where albuminuria did not set in for twenty four hours after the onset of eclampsia

Other particulars to be noted are the condition of the teeth signs of any focal infection presence or otherwise of any vaginal discharge oedema of the labia varicosity of the veins the condition of the nipples and the breasts and any other abnormalities that may be recognised in the course of a thorough examination of the patient

OBSTETRIC EXAMINATION

The next procedure is the obstetric examination This consists in noting the following —

The Height of the Uterus This varies with the period of pregnancy and may be altered by any complications The height of the uterus is not always a safe guide to the period of pregnancy as in cases of hydramnios concealed accidental hæmorrhage twins

monsters and tumours of the uterus complicating pregnancy the uterus may be much bigger than normal on the other hand it may be much smaller than normal in cases of intra uterine death of the foetus and oligo hydramnios. It should be realised that in the earlier weeks conditions like vesicular mole may increase the size of the uterus while in ectopic gestation and in cases of missed abortion the uterus may be much smaller.

Abdominal Palpation and Auscultation This must be done as a matter of routine and the observations recorded. The condition of the foetus is ascertained by means of the foetal heart and the exact presentation and position noted. It should be realised that not infrequently in the earlier part of the second half of pregnancy the position of the foetus may vary from time to time thus the foetus may be presenting as a breech sometimes as a shoulder or the head may be not quite flexed. We do not think there is any purpose in unnecessarily getting alarmed and what is worse in alarming the patient herself by mentioning these various abnormalities. So frequently do they occur before the thirty second week but correct themselves by the thirty sixth week that we have ceased to look upon them with any degree of apprehension and do not communicate these findings to the patient. We have frequently had patients referred to us in a condition of great mental excitement because of the injudicious remarks of the obstetrician that something serious was likely to occur because of an abnormal presentation or position having been noted. It is a fact that before the thirty sixth week of pregnancy the foetus frequently changes its position. Still when abnormal presentations are noted care must be taken to see that no important factors which could account for them are missed and whenever necessary the abnormality should be corrected.

A word of caution is however necessary. After correction of an abnormal presentation it may recur. When such correction has been made the patient should be seen at frequent intervals and in every case she should be advised that as soon as she has any slight pains she must seek the help of the obstetrician concerned. We do not hold the view that any great purpose is served by correcting an abnormality before the thirty fourth week of pregnancy and in the majority of cases such correction of abnormal presentations had better be done between the thirty fourth and thirty eighth weeks. We make this statement because so frequently have we noticed the tendency for the foetus to rectify its position spontaneously that it seems unnecessary to attempt interference earlier when nature can do it much more satisfactorily and thoroughly without disturbing the attitude of universal flexion.

Pelvimetry This gives valuable information when judging of the possibilities of natural delivery. It should be made as a matter of routine in all cases but especially—

- (1) In all primiparæ
- (2) In all cases with a history of difficult labour whether assisted or otherwise
- (3) In all cases where still births are recorded
- (4) In cases where the child died in the neonatal period even though born by natural efforts
- (5) In cases where accidents such as fractures of the extremities or of the pelvis have occurred

Pelvimetry may be either external or internal

The *external pelvic measurements* that should be ascertained are —

- (1) The intercrural
- (2) The interspinous
- (3) External conjugate
- (4) Posterior interspinous
- (5) Inter trochanteric
- (6) Antero posterior diameter of the outlet
- (7) Transverse diameter of the outlet

Particulars of these diameters and the method of ascertaining them are furnished in the chapter on Contracted Pelvis

Internal Pelvimetry This is of greater value because it gives the actual measurements of the bony birth canal but there are certain difficulties in obtaining them. They may be ascertained either by the hand or by a special pelvimeter generally Skutsch's internal pelvimeter. The particular diameter that is taken note of is the true conjugate at the brim of the pelvis. The significance of this measurement and the exact inferences to be drawn from it will be found in the chapter on Contracted Pelvis

Cephalometry Whatever may be the pelvic measurements they can only be a general indication of the type of the pelvis one has to deal with. *The most important point however from the obstetric point of view is to judge how far a particular head will go through a particular pelvis. In other words the question is not one of contracted pelvis but one of relative disproportion between the pelvis and the head.* For this purpose cephalometry may be helpful but the most important method of judging whether the head is too big or may go through a particular pelvis is the bimanual examination known as the Munro Kerr Muller method of trying to fit the cephalic pole into the pelvis and noting if any the extent of overriding

If all these different observations are recorded at the antenatal clinic on the first and subsequent occasions on which the expectant mother seeks advice much useful information will be available to enable the obstetrician to come to some conclusions regarding the probable nature of the delivery that he is later to undertake. It is important however to emphasise the fact that the pregnant woman must attend the antenatal clinic at regular intervals, and as we have noted already these intervals should not be less than a month before the thirty second week and should be at least a fortnight between the thirty second and thirty-sixth week and once a week thereafter. At each one of these visits the following routine examination should be made —

- (1) Urine examination with the necessary tests for albumin
- (2) A record of the blood pressure
- (3) Hæmoglobin estimation if necessary
- (4) A careful palpation to ascertain the lie position and presentation of the fœtus
- (5) Auscultation of the fœtal heart to ascertain the condition of the fœtus
- (6) Weight of the mother should be noted

A general and rapid survey of the condition of the patient with a view to detect any other anomalies should also be made. Where any defects have been noted naturally attention must be concentrated upon them.

ADVICE TO BE GIVEN TO THE EXPECTANT MOTHER

We shall now deal with the advice that is to be given to the expectant mother when she visits the antenatal clinic.

Impress upon her the need for regular attendance at the clinic and assure her that if some simple physiological laws are followed the course of pregnancy will be smooth and labour will be made safe. We do not hold that unnecessary alarm should be raised even in the presence of minor ailments as we consider that one of the most essential factors for success is the right mental attitude of the expectant mother. It would serve no useful purpose to make her worry about some slight ailments. On the other hand care should be taken by the obstetrician to emphasise in simple language certain signs or symptoms the appearance of which must necessitate an immediate consultation. He can assure the pregnant woman that if proper steps are taken in time the symptoms will abate and there need be no unnecessary anxiety.

The following points have to be borne in mind by the pregnant woman —

Diet. The diet should be simple and nutritious and regular habits should be cultivated. The physiological laws in regard to

diet should be observed even more rigorously during pregnancy than at other times. It is a mistaken belief that a pregnant woman should eat more so as to sustain her own needs and those of the fetus. Too rich foods, untimely meals and too much protein are undesirable. A good method of controlling the dietetic requirements is to take the weight of the woman frequently during the course of pregnancy. The maximum gain in weight as has already been stated should not exceed 5 lbs. per month. Rich carbohydrates should be taken in limited quantities. The diet should consist largely of fruits, vegetables, lean meat and a fair amount of milk. In some cases where any particular indication is present a richer diet may be allowed. The obstetrician should make him self thoroughly sure that the diet contains the vitamins in proper proportions. It is good to take a liberal amount of water. All forms of liquor should be avoided. This latter is not the same problem in all countries and where as in the tropics indulgence in alcohol is very rare among women it may not be necessary to refer to it at all. Smoking should be restricted as far as possible.

Exercise A moderate amount of exercise is always beneficial to the pregnant woman. It is a great mistake to confine her self to the house or to imagine that once pregnancy occurs she must give up all forms of exercise. At the same time heavy work, active and vigorous exercise such as will unduly tire her should not be allowed. In addition to the ordinary household duties the pregnant woman should be encouraged to indulge in walks in the open air. This she may do right through the whole course of pregnancy. Violent exercises on the other hand such as riding, skating, swimming and cycling should be discontinued because of the risk of causing abortion or miscarriage. Likewise it is inadvisable to indulge in long automobile journeys especially on bad roads.

Clothing The clothing that is worn by a pregnant woman should be light and not too tightly drawn around her body. High heeled shoes, tight or close fitting garments of all nature such as corsets or too light garments in the winter are to be deprecated. In the early weeks the waistbands of the clothing do not matter much but as the pregnancy progresses it is better if the garments be made to hang from the shoulders instead of being tightly tied round the waist. In some cases where there is a tendency for the uterus to fall forwards an obstetric belt may be worn to give proper support.

Care of the Teeth This is very necessary as in the majority of cases there is some degree of pyorrhea present and focal infections round about decayed teeth are likely to give rise to minor ailments sometimes favouring puerperal sepsis. For this reason proper cleaning of the teeth should always be insisted upon. In

some cases deficiency in the diet particularly in vitamins C and D may be responsible for decay of the teeth during pregnancy. If such be established these vitamins should be supplied. Vitamin C is available in strongly acid foods such as lemons and oranges and in green leafy vegetables like cabbage and lettuce. Milk also contains an ample amount of it when it is freshly drawn but it is lost after boiling. Vitamin D is supplied in eggs.

Care of the Breasts This is very important and should be attended to in the last weeks of pregnancy. When the breasts begin to enlarge the clothing should be such that it does not cause undue pressure. If the breasts become unduly big and heavy some form of support should be provided by a properly fitting brassiere. In the latter weeks the nipples should be washed daily with soap and water and drawn out. Any cracks should be attended to.

Bowels The bowels should be kept regular during the whole of pregnancy. They must move at least once a day and every effort should be made to secure this by dietary regulations. It is not advisable to give cathartic purgatives especially in the early weeks of pregnancy. If the bowels do not move one or other of the mineral oils may be tried and the diet suitably modified by an increase in the quantity of vegetables and fruits. In the later months it is perhaps well to see that the bowels are fairly well moved by a light purgative. Half an ounce of castor oil given every fortnight from the twenty-eighth week of pregnancy is beneficial.

Bath A daily bath is of great value and should generally be warm. Extremes of temperature either hot or cold should be avoided. In the tropics the bath is an even greater necessity and should be a regular feature right through the whole course of pregnancy. It is not desirable however to use tub baths in view of the risk of organisms entering the vagina. Shower baths or the ordinary forms of bath indulged in in the tropics can be safely continued throughout.

Sexual Intercourse It is inadvisable that any sexual intercourse should be permitted after the twenty-eighth week of pregnancy. The danger of infection is very great and many instances have been reported of puerperal sepsis in women who had intercourse within the last few weeks of delivery. Excesses of all sorts must be avoided. In conditions where repeated abortions have taken place it is better that all marital relations are given up also in cases where premature labour has occurred.

Mental Hygiene The prospective mother should maintain an equable temperament and should avoid all mental excitement. It is well for her to read some good literature books which are not sensational and to know something of what is expected of her.

as a mother. Maternal impressions go a long way to create the proper mental environment necessary to regard pregnancy and labour as physiological processes not to be dreaded and while it is impossible in some cases to relieve the mother entirely of some mental disquietude in the large majority of cases it is possible to assure her and to gain her confidence. Not infrequently we have noted that sudden death after labour has occurred in women whose frame of mind was so hopelessly pessimistic that they expected the worst when labour started. Such a frame of mind is of graver prognostic significance than any of the serious complications of labour.

General Advice. The patient should be warned of particular symptoms which when present should immediately make her seek obstetric aid. Bleeding from whatever cause, reduction in the quantity of urine, any swelling of the lower extremities, continuous headache, pain in the epigastrium, dimness of vision, cramps in the legs, painful contractions of the uterus from whatever cause, rupture of the bag of membranes irrespective of the period of pregnancy should all make her report to the obstetrician for suitable advice. If everything is normal the pregnant woman should attend the antenatal clinic at periodic intervals as mentioned earlier in this chapter. Any of the minor ailments of pregnancy such as cramps in the leg, pelvic pain, varicose veins, hemorrhoids, palpitation, increased vomiting, etc. should necessitate a consultation.

The pregnant mother should be told when she may expect labour to begin and all arrangements should be made so that at the onset of labour she will have the adequate assistance of a well qualified midwife and be in possession of the necessary outfit and armamentarium required for a delivery. If these precautions are taken there should be no difficulty whatsoever in attending to the woman in labour.

One word of caution must be given. Antenatal care is not an end in itself but is a means to an end, namely, the safe delivery of both mother and child. Antenatal care will go far to ensure this but something else is also essential besides efficient antenatal care and that is efficient intranatal and postpartum care. Nothing that can be done by antenatal care will be of any avail if proper obstetric help is not available during labour. We hold to the belief that while antenatal care can be given efficiently by a large number of practitioners, cases do occur where it is desirable because of possible difficulty at labour that the expectant mother should be referred to a consultant antenatal clinic manned by specialists. Where there is adequate antenatal supervision, skilled midwifery and proper attention to details at the bedside, vigilant postnatal care and hospital treatment if necessary, maternal mortality is reduced to a quarter of the national average. It is

also well to realise the limitations of antenatal care in certain respects certain conditions cannot be diagnosed by any efficient method of antenatal care In other cases complications may arise without any previous warning and it is unreasonable to conclude from these that antenatal care has failed In the majority of cases antenatal care will certainly help the patient to go through pregnancy safely and to face labour with equanimity

The care of the woman in labour will be discussed in the subsequent chapters

SECTION III

PHYSIOLOGY OF LABOUR

CHAPTER V

CAUSATION AND STAGES OF LABOUR

Definition Labour is the process by which the products of conception when they have reached full term or are nearing it are separated from the uterus and expelled through the genital passages

Labour may end spontaneously or may require external aid to complete it. When a full term foetus presenting by the vertex is expelled by natural efforts on the part of the mother and unaided by external help within a period of twenty four hours the term normal or natural labour is used to designate the condition. If the foetus has not attained maturity when it is expelled we speak of *premature labour*. Spontaneous expulsion of the products of conception before the period of viability of the foetus is termed *abortion or miscarriage*.

Causes of Labour What is it that brings about the uterine contractions which cause separation and expulsion of the products of conception when the foetus has reached term? So far no particularly clear theory has been expounded which will answer this question. There are several factors which may have a bearing on it and among the many theories advanced are —

- (1) Increased irritability of the uterine musculature
- (2) Dilatation of the cervix by the presenting part
- (3) The periodicity of the menstrual epoch
- (4) Certain changes occurring in the decidua during the latter half of pregnancy
- (5) The circulation in the maternal blood of a foetal antigen causing an anaphylactic reaction
- (6) The influence of certain hormones
- (7) Heredity and habit

It is futile to discuss these theories at length and in all probability more than one factor is responsible for the causation of labour. The increasing knowledge of the part played by the endocrine hormones during pregnancy and parturition may possibly

throw some light on the essential factor responsible for the causation of labour. Further investigations are required before any definite pronouncement can be made.

Stages of Labour Three stages are generally recognised in the process of labour.

To these may be added what may be called the preparatory stage of labour which may begin about two to three weeks before the onset of labour in a primigravida and a few days before in a multigravida. The phenomena of this preparatory stage consist in—

(1) The falling forward of the uterus with the head sinking into the pelvis resulting in the so called lightening due to the relief of pressure exerted by the gravid uterus upon the diaphragm and therefore on the lungs and heart.

(2) The gradual shortening of the cervix and the dilatation of the internal os—a process that commences some days before the actual onset of labour in some instances.

(3) False or spurious labour pains which occur more frequently in primigravida than in multipara. False pains are often caused by a temporary indigestion or by a loaded rectum. They are relieved either by a laxative or an enema. They are distinguished from true labour pains by their temporary character, irregularity and by the nature of the pains which are felt generally over the abdomen instead of in the lumbosacral region or just above the pubis. They do not progress and do not cause any dilatation of the cervical canal.

When true labour pains set in the three stages referred to already will be noted. They are —

- (1) The first stage—or the stage of dilatation
- (2) The second stage—or the stage of expulsion
- (3) The third stage—or the stage of placental delivery and uterine contraction and retraction

FIRST STAGE

This extends from the onset of true labour pains to the complete dilatation or dilatability of the os when rupture of the membranes usually occurs. The duration of this stage is variable. On an average it extends in a primigravida to sixteen hours while in a multigravida the average is from six to eight hours.

The phenomena during this stage of labour are —

- (1) True uterine contractions or labour pains
- (2) A mucosanguinous discharge or the show
- (3) The dilatation of the cervical canal so that both the internal and the external os become completely dilated

- (4) In the normal cases fixation of the head at the brim of the pelvis and its progressive descent
- (5) Rupture of the membranes

(1) *True uterine contractions* or labour pains occur at intervals of half an hour at the commencement of the first stage, but gradually they come on more frequently, till towards the end of the first

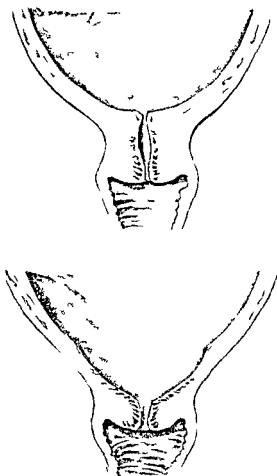


FIG. 35.—Stages of dilatation of the cervical canal in a primipara

stage they may occur every few minutes. At first the pains are felt in the region of the sacrum, but later they radiate to the lower abdomen, and sometimes down the legs. In some cases they may be associated with a feeling of nausea or actual vomiting and urine may be passed frequently. The cervix becomes more soft and more patulous, till at the end of this stage its rim becomes continuous with the walls of the vagina.

(2) The muco-sanguinous discharge is both vaginal and cervical. The dilatation of the lower uterine segment and of the cervix that occurs in the first stage promotes separation of the membranes from the wall of the uterus giving rise to a slight hæmorrhage while the mucous discharge is generally the operculum present at the cervical canal that is loosened and discharged. This blood

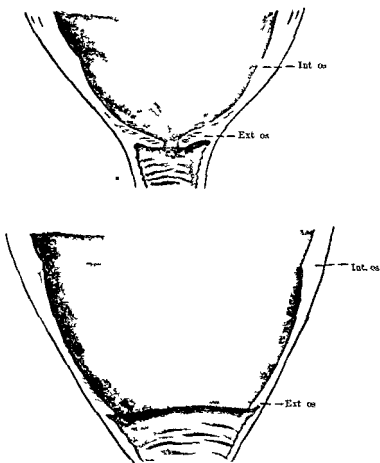


FIG. 36.—Further stages of dilatation of the cervical canal in a primipara

stained mucus is known as the show and is valuable corroboration that accompanying pains are true labour pains

(3) *Dilatation of the Cervix* As a result of these contractions the uterus early in labour becomes converted into an upper thick walled contractile portion and a lower thin walled passive segment. As labour proceeds the wall of the upper uterine segment which contracts and retracts becomes thicker and thicker while the lower uterine segment which is fairly well

differentiated expands and receives the body of the foetus causing progressive thinning of its walls. With the dilatation of the lower uterine segment the cervical canal also proceeds to dilate. The process of dilatation is brought about by three factors —

(i) The pressure of the bag of membranes exerted continuously on the somewhat soft cervical canal

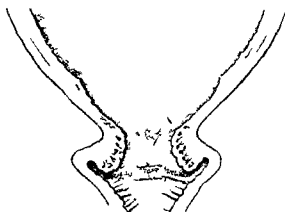
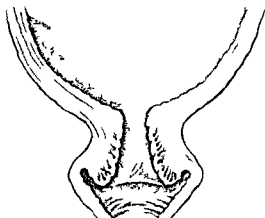


FIG. 37 —Stages of dilatation of the cervical canal and vagina

(ii) At the same time the uterine contractions help to pull up the cervical canal over the presenting part by the contraction of the longitudinal fibres.

(iii) The third factor may occasionally come into play when the bag of membranes ruptures prematurely that is the pressure exerted by the presenting part.

The process of cervical dilatation differs somewhat in a primipara from a multipara. At the commencement of labour in a primipara the whole of the cervical canal is closed both the internal and external os being completely occluded. The dilatation therefore is progressively from above downward, the internal os dilating first then the cervical canal and last of all the external os. In a multipara on the other hand at the commencement of labour, the external os is patulous usually admitting freely one finger *sometimes more*. The internal os although closed is not quite so completely closed as in a primiparous cervix. The process of dilatation therefore is a little more rapid and easy inasmuch as the dilatation of the internal os brings about a simultaneous dilatation of the whole cervical canal the external os being already open.

(4) In the majority of cases *the head becomes fixed* at this stage if it has not already done so in the last weeks of pregnancy. Non fixation of the head in cephalic presentations suggests the possibility of abnormalities.

(5) The *membranes usually rupture* after full dilatation of the cervix when the second stage commences.

✓ SECOND STAGE,

The second stage or the stage of expulsion extends from the complete dilatation or dilatibility of the cervical canal and rupture of the membranes to the expulsion of the fœtus. This stage may last from two to three hours in a primipara and from one to two hours in a multipara.

The phenomena of this stage consist in —

- (1) The occurrence of the characteristic uterine contractions
- (2) The coming into action of the accessory muscles of labour
- (3) The progressive descent of the presenting part
- (4) The dilatation of the vagina and vulva with stretching of the pelvic floor
- (5) The expulsion of the fœtus

Uterine Contractions The nature of the uterine contractions gradually changes getting stronger in the second stage, they are more severe than in the first stage and are of a bearing down character. The voluntary muscles—the accessory muscles of labour—also begin to contract and exert their influence towards the end of the second stage. The diaphragm and the abdominal muscles begin to act and the patient clutches at anything she can get hold of. With each of these pains the fœtus is driven down through the dilated cervical canal and the vagina relaxes to

receive it. When the perineum is reached it is stretched so that it begins to bulge with every uterine contraction. The presenting part is now directed upwards and forwards towards the orifice of the vulva by the pelvic floor. Between the pains the soft parts press back the fœtus till the presenting part is so firmly fastened under the symphysis pubis that this cannot occur.

Lastly there is the gaping of the vulva when the presenting part is fixed under the symphysis pubis—the phenomenon known as crowning of the head in vertex presentations. Relaxation of the anus occurs and the patient feels the need to micturate and defecate. This is due to the pressure of the presenting part on the bladder and rectum and lastly the head passes through the external opening with a series of almost continuous uterine contractions helped by involuntary straining efforts on the part of the patient due to the action of the accessory muscles of labour. As expulsion of the head takes place the patient utters a sharp cry or groan and thereafter the rest of the fœtus is born.

✓ THIRD STAGE

The third stage or the stage of placental delivery is very important and should be carefully watched. This extends from the complete expulsion of the fœtus to the complete expulsion of the placenta and membranes and firm contraction and retraction of the uterus subsequently. The average duration of this stage when spontaneously completed may extend from half to one hour.

As soon as the birth of the fœtus is over the woman feels relief and is calm and comfortable. Now and again there may be a feeling of fullness, caused by the sudden evacuation of the uterus especially after the delivery of a large sized fœtus or when the uterine contents have been suddenly evacuated as in a case of hydramnios or twins.

The phenomena of the third stage of labour are —

- ✓(1) The characteristic uterine contractions
- (2) The separation of the placenta after the formation of a retroplacental hæmatoma
- (3) The expulsion of the placenta
- (4) The control of the hæmorrhage
- (5) The permanent contraction and retraction of the uterus

Uterine Contractions After the completion of the second stage the uterus will be found almost at the level of the umbilicus and is firm and round and hard as a cricket ball. Rhythmic contractions will occur and the patient may sometimes feel the puns.

The process of cervical dilatation differs somewhat in a primipara from a multipara. At the commencement of labour in a primipara the whole of the cervical canal is closed both the internal and external os being completely occluded. The dilatation therefore is progressively from above downwards the internal os dilating first then the cervical canal and last of all the external os. In a multipara on the other hand at the commencement of labour the external os is patulous usually admitting freely one finger sometimes more. The internal os although closed is not quite so completely closed as in a primiparous cervix. The process of dilatation therefore is a little more rapid and easy inasmuch as the dilatation of the internal os brings about a simultaneous dilatation of the whole cervical canal the external os being already open.

(4) In the majority of cases the head becomes fixed at this stage if it has not already done so in the last weeks of pregnancy. Non fixation of the head in cephalic presentations suggests the possibility of abnormalities.

(5) The membranes usually rupture after full dilatation of the cervix when the second stage commences.

✓ SECOND STAGE,

The second stage or the stage of expulsion extends from the complete dilatation or dilatability of the cervical canal and rupture of the membranes to the expulsion of the foetus. This stage may last from two to three hours in a primipara and from one to two hours in a multipara.

The phenomena of this stage consist in —

- (1) The occurrence of the characteristic uterine contractions
- (2) The coming into action of the accessory muscles of labour
- (3) The progressive descent of the presenting part
- (4) The dilatation of the vagina and vulva with stretching of the pelvic floor
- (5) The expulsion of the foetus

Uterine Contractions The nature of the uterine contractions gradually changes getting stronger in the second stage, they are more severe than in the first stage and are of a bearing down character. The voluntary muscles—the accessory muscles of labour—also begin to contract and exert their influence towards the end of the second stage. The diaphragm and the abdominal muscles begin to act and the patient clutches at anything she can get hold of. With each of these pains the foetus is driven down through the dilated cervical canal and the vagina relaxes to

receive it. When the perineum is reached it is stretched so that it begins to bulge with every uterine contraction. The presenting part is now directed upwards and forwards towards the orifice of the vulva by the pelvic floor. Between the pains the soft parts press back the foetus till the presenting part is so firmly fastened under the symphysis pubis that this cannot occur.

Lastly there is the gaping of the vulva when the presenting part is fixed under the symphysis pubis—the phenomenon known as crowning of the head in vertex presentations. Relaxation of the anus occurs and the patient feels the need to micturate and defecate. This is due to the pressure of the presenting part on the bladder and rectum and lastly the head passes through the external opening with a series of almost continuous uterine contractions helped by involuntary straining efforts on the part of the patient due to the action of the accessory muscles of labour. As expulsion of the head takes place the patient utters a sharp cry or groan and thereafter the rest of the foetus is born.—

✓ THIRD STAGE

The third stage or the stage of placental delivery is very important and should be carefully watched. This extends from the complete expulsion of the foetus to the complete expulsion of the placenta and membranes and firm contraction and retraction of the uterus subsequently. The average duration of this stage when spontaneously completed may extend from half to one hour.

As soon as the birth of the foetus is over the woman feels relief and is calm and comfortable. Now and again there may be a feeling of faintness caused by the sudden evacuation of the uterus especially after the delivery of a large sized foetus or when the uterine contents have been suddenly evacuated as in a case of hydramnios or twins.

The phenomena of the third stage of labour are —

- ✓(1) The characteristic uterine contractions
- (2) The separation of the placenta after the formation of a retroplacental hæmatoma
- (3) The expulsion of the placenta
- (4) The control of the hæmorrhage
- (5) The permanent contraction and retraction of the uterus

Uterine Contractions After the completion of the second stage the uterus will be found almost at the level of the umbilicus and is firm and round and hard as a cricket ball. Rhythmic contractions will occur and the patient may sometimes feel the pains.

Placental Detachment As the foetus is being delivered separation of the placenta may take place. The shrinkage of the placental site and the forcing downward of the whole placental mass by the uterine contractions may cause the separation. There are two methods by which placental separation may occur —

(1) On account of the contractions of the uterus the placenta may be folded on itself so that the long axis of the placenta corresponds to the long axis of the uterus and the margin that

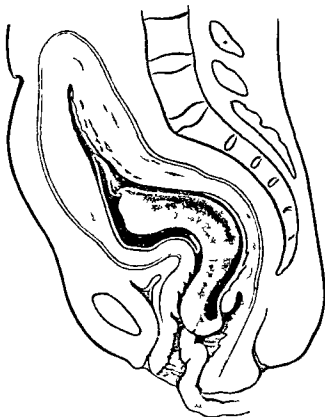


FIG. 38 Mechanism of the expulsion of placenta—Duncan's

presents at the cervix or vagina is the lower margin showing perhaps a little of the foetal surface.

(2) The second method is the one where the placenta may separate at its centre. A retroplacental hematoma is formed which with each contraction of the uterus forces more of the placenta to separate and the placenta thus separated presents itself at the vaginal outlet with the centre of its foetal surface with the attached cord like an inverted umbrella.

It is of little significance which method of separation is responsible for its final delivery.

The expulsion of the placenta usually occurs within half to one hour after the birth of the foetus. During this period the uterus should be moderately hard as the result of tonicity so that when the placenta separates the contractions and retractions of the uterus will arrest hæmorrhage by closure of the placental

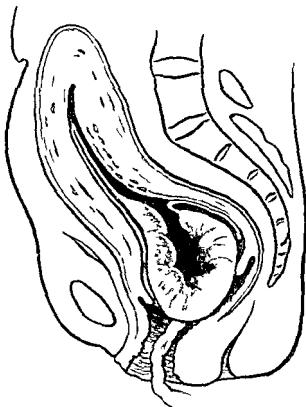


FIG. 39—Mechanism of the expulsion of placenta. Schultze's.

sinuses. The control of hæmorrhage after separation of the placenta is due to three factors —

- (1) The contraction and retraction of the uterus constricting the vessels passing through the uterine wall to the placental site
- (2) The constriction of the torn vessel walls themselves
- (3) The formation of blood clots which favour the closure of the lumen of the vessels

During the third stage there is always a moderate amount of bleeding but in a normal case it does not exceed about 600 c.c.

When the labour is over the patient may occasionally have a shivering fit which is purely a vasomotor phenomenon and is not indicative of infection and is generally of no particular significance. It is termed the 'physiological chill'.

CHAPTER VI

THE MECHANISM OF LABOUR

By this term is meant the manner by which the fœtus adjusts itself to and passes through the parturient canal so as to negotiate it with the minimum amount of difficulty.

The three factors concerned in labour are the passages, the passenger and the forces. The effect of each one of these and the pathological variations that may occur in any of them are material factors to be taken note of in the mechanism of labour. It will thus be appreciated that the mechanism of labour may vary infinitely depending upon the variations in any of these three factors. Contractions of the pelvis and abnormalities of the soft parts may be responsible for variations in what is spoken of as the normal mechanism of labour. So also with the passenger, the position, presentation and variations in the degree of flexion—not to speak of the size of the presenting part and other abnormalities associated with it—are factors that influence and change the mechanism of labour. Lastly, the forces by which we mean the uterine contractions may also cause abnormalities of mechanism.

✓ MECHANISM OF LABOUR IN A VERTEX PRESENTATION

We shall deal with the mechanism of labour in a vertex presentation with the head in the first position, left occipito-anterior, with a normally sized pelvis and with a fœtus that is also average in size and weight.

Certain terms are used in connection with the mechanism which it would be well to explain at this stage.

(1) **Engagement or Fixation of the Presenting Part.** By this is meant that the presenting part enters the superior strait of the pelvis. In cases of vertex presentations the head generally engages about two to three weeks before the onset of labour in a primipara and two to three days before the onset in a multipara. Sometimes this may not occur until after the commencement of labour in both primiparae and multiparae. An important point to remember is that failure of engagement may denote an abnormality—a relative disproportion between the presenting part and the pelvis. A clear realisation of the extent of the disproportion and the causes which have favoured the non-engagement of the presenting part will be of material assistance in evaluating the possibilities of normal delivery.

✓ (2) **Flexion** This is the term used to denote the fact that the head is bent so that the chin is resting on the chest. Flexion may vary in its degree. Usually at the commencement of labour, there is a tendency for increased flexion so that the head is bent well forward. In some cases there may be a deficiency in this attitude of flexion. The result of this is that the head tries to engage with a diameter which is not the shortest diameter and accordingly considerable difficulty may be experienced in the progress of the head. In other cases again where increased resistance is met by the presenting part, there may be an increase in flexion. This occurs in cases of generally contracted pelvis and brings the occiput to present instead of the vertex. With a normal degree of flexion the diameter of engagement in a vertex presentation is the suboccipito bregmatic measuring $3\frac{1}{2}$ ins.



FIG. 40.—Moulding and caput in a vertex presentation

✓ (3) **Moulding** This is the term applied to the changes that take place in the foetal head because of the pressure exerted upon it in its passage through the pelvic canal. The foetal head differs from the adult head in that there are a number of bones which are united by membranous sutures and fontanelles. This permits of a certain amount of overlapping of the bones of the vault of the skull so that the parietal bones overlap each other and the frontal and occipital bones pass underneath the parietal bones. This overlapping of the bones tends to diminish the diameters of the foetal skull in its passage through the birth canal and this process of adaptation of the foetal head by means of overlapping of the bones is known as head moulding. This is a factor of much value in facilitating the descent of the head and it will be noted that in those cases where such overlapping or moulding cannot take place as in cases of post mature foetus the resistance offered to the passage of the foetal head is much greater.

Let us next consider the various stages in the mechanism of labour in a vertex presentation. They are —

- (1) Descent with engagement of the head and increased flexion
- (2) Internal rotation
- (3) Extension resulting in the birth of the head
- (4) Restitution or the untwisting of the neck
- (5) External rotation of the head accompanied with internal rotation of the shoulders
- (6) Delivery of the shoulders
- (7) Expulsion of the rest of the body of the fœtus

It may be said that descent is a common phenomenon associated with every one of these movements and, as a matter of fact, without descent very few of the movements can take place

(1) **Descent with Increased Flexion and Engagement of the Head** In normal cases the head engages in what is known as a *synclitic* manner in other words the sagittal suture of the head lies in one or other of the oblique diameters of the pelvic brim so that the parietal bones on either side are at the same level. Where abnormalities of mechanism occur, the sagittal suture may be pushed towards the symphysis pubis or the sacral promontory. Under such circumstances *asynclitism* is said to occur. When the sagittal suture is diverted towards the sacral promontory and the anterior parietal bone is leading the condition is known as *anterior asynclitism*, or *Nacgel's obliquity*. Where the sagittal suture is closer to the symphysis pubis and the posterior parietal bone leads it is known as *posterior asynclitism* or *Litzmann's obliquity*. The mechanism under such circumstances is dealt with later.

As the head continues to descend moulding takes place and as the head passes through the pelvic cavity the portion of the presenting part which is in contact with the pelvis is subjected to pressure and within this girdle a boggy, œdematous swelling of the soft tissues overlying the cranial bones results. This swelling is known as a *caput succedaneum* and is located upon the most dependent portion of the head, usually over the parietal bones, sometimes over the occipital bone. The swelling is due to infiltration of the subcutaneous connective tissue with a sero-sanguinous transudate. The position of the caput depends upon the position and presentation of the fœtus during labour, and it can therefore be a method of determining after birth the position of the fœtus.

This movement of descent is brought about by two factors, namely, the 'general contents pressure' of the uterus before

rupture of the membranes and the fetal axis pressure which comes into effect after the rupture of the membranes

✓(2) **Internal Rotation** The head engages in one or other of the oblique diameters of the pelvic brim and once it has entered the cavity the next movement takes place—internal rotation. This movement helps to bring the diameter of engagement of the fetal head to the longest diameter of the pelvic cavity available for the passage of the head. It has been pointed out that the

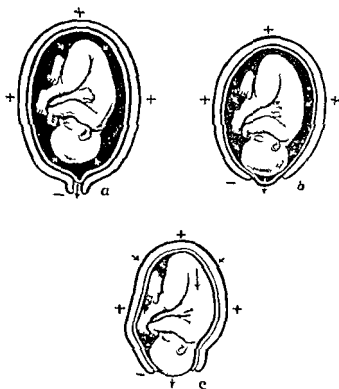


FIG. 41

a On rupture of membranes b Critical canal to fetal resistant axis in engaging
c Fetal axis pressure after rupture of membranes

longest diameter of the pelvis varies at different levels at the brim the longest diameter is the oblique diameter whereas at the outlet the antero posterior diameter is the longest diameter. With a view to adapting itself to the varying diameters of the pelvis the head changes its position by rotating the leading part forwards and this movement is known as internal rotation. In the first position of the vertex the movement occurs through one eighth of a circle bringing the occiput to lie underneath the symphysis pubis.

Internal rotation is brought about by the following factors —

- (i) The shape of the pelvis the forward incline of the walls of the pelvic cavity helps to rotate forwards the most dependent part of the presenting pole
- (ii) The tendency to forward rotation is helped by the contour of the musculo fascial slings forming the pelvic floor
- (iii) The impetus given by the spine of the ischium is another dominant causative factor in this phenomenon
- (iv) The effective contractions of the uterus are essential to promote internal rotation

In those cases where deficient flexion fails to cause the occiput to be the most dependent part rotation of the occiput forward

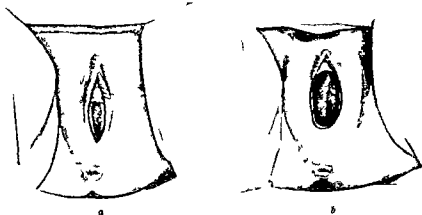


FIG. 4 —Second stage the head stretching the perineum

may be impeded. Also where there is a deficiency of the pelvic floor from previous lacerations rotation may also be rendered difficult or delayed. Lack of uterine contractions as in cases of uterine inertia or weak pains may prevent the completion of internal rotation hence prolongation of the second stage of labour may occur necessitating in some cases artificial aid.

(3) Extension and Birth of the Fœtal Head When internal rotation is completed the occiput comes to lie underneath the symphysis pubis and the head is in an attitude of flexion. Subsequent uterine contractions favour the next movement so essential for the birth of the head namely extension. Extension is the resultant of two forces the effect of the uterine contractions from above and the elastic resistance of the pelvic floor from below. As a result of extension the occiput hitches against the symphysis pubis the face sweeps over the perineum and the successive parts of the fœtal head to be born are the sinciput the orbital ridges nose mouth and chin. At this stage the perineum is stretched

and if proper support is not available or if the head descends too rapidly in the process of extension the perineum may be torn—the degree of the tear depending upon the force with which the head comes down the rapidity with which the perineum is stretched and the particular diameter of the head that stretches the perineum.

An abnormal mechanism may show up for the first time at this stage as in *occipito posterior positions* where internal rotation has resulted in the occiput lying in the sacral hollow and the head being delivered with face to pubis.

(4) **Restitution** As soon as the head is free outside the vulval outlet it rotates through one eighth of a circle and thus the neck is untwisted and the chin rotates towards the right side in cases

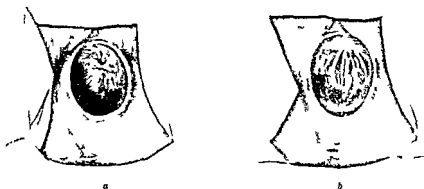


FIG. 43.—Delivery of the head

(a) Crowning

(b) Head emerging at the outlet

Note the stretching of the perineum

of left occipito anterior positions and towards the left in cases of right occipito anterior positions.

(5) **External Rotation** After the untwisting of the neck has occurred the next movement is one of internal rotation of the shoulders. This brings the anterior shoulder underneath the symphysis pubis and with this movement occurs external rotation of the head. The bisacromial diameter is brought into the antero-posterior diameter of the pelvic outlet. In the left positions of the occiput the head turns further towards the mother's right until the face points directly to the right thigh and in the right positions of the occiput the head turns in the reverse direction.

Restitution and external rotation frequently occur in such quick succession that they may practically appear to be one continuous movement but if a careful observation be made it will be found that restitution occurs first and after a short interval external rotation takes place.

Once the shoulders have rotated into the antero posterior diameter of the outlet descent continues with the uterine contractions until the anterior shoulder latches underneath the symphysis pubis and the posterior shoulder sweeps over the perineum by a

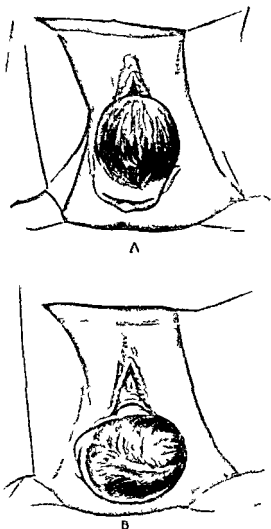


FIG. 44.—Delivery of the head

A Extension complete

B Flexion complete

process of latero flexion of the spine and is delivered first followed a little later by the slipping forward of the anterior shoulder from underneath the symphysis pubis. After the expulsion of the shoulders the fetal body slip down through the pelvic cavity and the rest of the body is thus delivered.

THIRD STAGE

During this stage the placenta and membranes become separated from the uterine wall and are then extruded through the vaginal outlet. For some time after the birth of the child the placenta remains firmly fixed *in situ* to the uterine wall. Later, by one of two methods of separation already described, the placenta gradually separates, and with it the membranes peel off and the whole is expelled through the vaginal outlet. With the separation of the placenta, and sometimes with its extrusion, a certain amount of bleeding occurs associated with some slight pains. Once the placenta has been expelled, the uterus begins to contract and retract, till it becomes as hard as a cricket ball and so any bleeding completely stops.

CHAPTER VII

CONDUCT OF NORMAL LABOUR

It is important to realise that labour is a physiological process, and that in the majority of cases nature is in a position to complete the delivery without any artificial aid. The attitude of the obstetrician has been described as "one of masterly inactivity and watchful expectancy." Nowhere is there greater need than in the practice of obstetrics to desist from the temptation of interfering too frequently or too prematurely and the success of the obstetrician is in the reverse proportion to the number of cases where he has actively interfered. "Meddlesome midwifery" is more responsible for a great deal of maternal morbidity and a fair proportion of maternal mortality than any other factor, and in the stress of modern life, with its preoccupations there is the danger that the obstetrician may be inclined to interfere with nature and complete the process of labour, either because of the time natural delivery is to take or because of insistent demands by the patient or her friends. Looked at from the larger point of view and particularly with regard to the future life history of the patient, it must be conceded that the maximum amount of safety, both at the time of confinement and later, lies in the minimum amount of interference. One must resolutely desist from the temptation to interfere artificially, simply because of prolongation of the stages of labour, or because of feeling that it is better to terminate the agony of the patient earlier. At the same time it is important to realise that though it is desirable to allow nature to complete the process of delivery, one should not wait too long that some permanent

MANAGEMENT OF LABOUR

The obstetrician engaged for a confinement should respond as promptly as possible when a call comes since there are several complications that can easily be remedied at an early stage in labour but if left untreated lead to dangerous consequences. In cases of malpresentations malposition prolapse of the cord hydramnion toxic conditions etc. the earlier the patient is attended to the more successful will be the outcome for mother and child.

For this purpose we would emphasise the necessity in hospital of encouraging as much as possible the practice of booking so that no patient is admitted into the intern department of a maternity institution who has not already been booked—that is who has not attended the antenatal clinic and acted up to the antenatal advice and any other instructions given her. It is desirable if maternal morbidity and mortality are to be reduced to a minimum that institutions should insist upon this.

Another advantage is that the obstetrician called on to conduct the labour by perusing the antenatal record of the patient is in a position to decide what particular mode of delivery is to be expected and prepare accordingly.

PREPARATION OF THE PATIENT

The pubic hair should be shaved and the parts cleansed with soap and water. Whenever possible it is wise to give the patient a bath. There has been some controversy over this point due to the fact that the common type of bath in the West is the tub bath where the patient sits in the water which is contaminated by her own sweat etc. and it is just possible that some of the dirt may find its way into the vaginal passage. But in the ordinary type of bath given in the tropic where there is no bath tub used but water is poured over the patient's body and finds its way out through a drain there can be no possible objection to such a bath being given to the woman in labour and as a matter of fact it is desirable that it should be given.

Before the bath is given it is preferable to give the patient a large soap and water enema to empty the bowels. One of the conditions which may impede the progress of labour is a loaded rectum and in every case where the patient complains of labour pains it is desirable that the enema should be given as early as possible. Another advantage of giving such an enema is that in cases where the patient is having false pains the pains may pass off. On the other hand if the pains are real they will increase in severity after the bowels have been emptied. Where however the patient is advanced in labour particularly if the head has

descended low it is not desirable to give an enema. Where the patient has to be delivered immediately by operative measures an enema should be strictly forbidden. In such cases if an enema is given the chances are that with some amount of pressure the enema water may go in but will not be expelled till the time of delivery when a spray of fluid out of the rectum will contaminate the surrounding area and be a fruitful source of septic infection.

OBSTETRIC EXAMINATION

After an enema has been given and the patient has had a bath and has been prepared she should be made to lie on a couch and a careful examination should be made. This consists of inspection, palpation, auscultation and where absolutely necessary a vaginal examination. The period of pregnancy should be estimated from the height of the uterus, the position and presentation of the foetus should be made out, the position and rate of the foetal heart should be ascertained, any anomalies with reference either to the foetus or the mother should be noted and only in those cases where any doubt is felt or the stage of labour cannot be definitely ascertained or the history of the patient does not agree with the clinical findings or where there is any complication such as hæmorrhage, need a vaginal examination be made.

VAGINAL EXAMINATION

Strict antiseptic precautions should be taken before an internal examination is made. No matter how carefully done there is always an attendant risk in such examination and it is extremely desirable that the obstetrician should desist from making such an examination unless there is a clear indication.

Where an examination is decided upon the external genitalia should be carefully washed, cleansed with soap and water and the parts painted with a 2 per cent aqueous solution of iodine. The obstetrician should have cleansed his hands thoroughly, dipped them into antiseptic lotion and put on dry sterile gloves.

With the patient in the dorsal position the obstetrician separates the labia minora by two fingers of one hand and introduces two fingers of the other hand directly into the vaginal canal. Care must be taken to see that the fingers do not rub against the perineum or come in contact with any portion of the anus.

When a vaginal examination is made all the available information possible should be ascertained. The practice of frequently making vaginal examinations with a view to find out one or other of the several factors to be observed is to be strongly

deprecated When a vaginal examination is made early in labour, the following points should be determined —

- (1) The condition of the vulva, the vagina, the extent to which they are dilatable and the presence of any lubricating mucus
- (2) The condition of the bladder and rectum
- (3) The condition of the cervix—whether the cervical canal is dilated and the extent to which the external os is dilated or dilatable

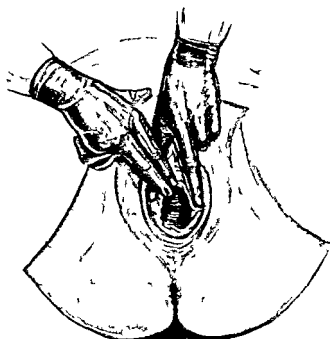


FIG. 45.—Method of making a vaginal examination

Note the direction in which two fingers are introduced into the vagina

- (4) Whether the membranes are entire or ruptured If present, the nature of the bag and whether the membranes are tough
- (5) The presenting part—whether it is the head or any other part of the foetus and the particular details concerning the presenting part In cephalic presentations the position of the fontanelles should be ascertained with reference to the maternal pelvis
- (6) The presence of a caput and the degree of moulding in cephalic presentations
- (7) The exact position of the presenting part with reference to the maternal pelvis—whether the head is at the brim, or through the inlet in the cavity, or at the outlet

- (8) Whether in cases of cephalic presentation the occiput has rotated and if so, to what extent
- (9) Whether the sacral promontory can be palpated or not
- (10) The capacity of the pelvic cavity and any abnormalities either in the soft parts or the bony passages
- (11) The presence of abnormalities such as a prolapsed cord or a placenta previa

It is impossible to enumerate all the conditions that one may meet with but it should be clearly understood that where an internal examination is made it should be as thorough as possible and should determine all abnormalities in regard to the passages and the passenger

Should a Vaginal Examination be Repeated? Ordinarily there should be no occasion for a repetition of a vaginal examination in a normal case. It is unnecessary to make a vaginal examination as is sometimes recommended soon after the membranes have ruptured. The only condition which is likely to be missed is a prolapsed cord but this is most unlikely to occur if the head is already fixed which fact should have already been ascertained. It is also unnecessary to make repeated vaginal examinations to determine from time to time the manner in which the head is descending. A much better method of watching this is by using the second pelvic grip or by perineal palpation. From due consideration of the other methods of examination available, and a proper appreciation of the facts revealed therefrom it will be found that the need for a vaginal examination becomes much less. In many instances it is possible to conduct a normal labour without any internal examination at all since the chief information gained through the vagina is the stage of dilatation of the cervix and it is often not specially important to know this.

In cases of prolonged labour or where there is evidence of maternal or foetal distress or where a case is seen for the first time in the second stage of labour or where a definite history is not available or where abnormalities arise during the course of labour, it may be necessary to make a further vaginal examination either to ascertain the exact nature and degree of the abnormality or as a preliminary to operative interference.

PELVIMETRY

If the patient has not been seen antenatally the importance of ascertaining pelvic measurements need not be emphasised. Pelvimetry should be done as a matter of routine in all primiparae and the following pelvic measurements should be taken namely the intercrural the interspinous the external conjugate and the antero posterior and transverse diameters of the outlet. If there

is any suspicion of pelvic deformity other measurements may also be necessary. In such cases internal pelvic measurements may have to be taken with a view to ascertain the exact nature and degree of the contraction.

If the patient is a multipara pelvic measurements may not be necessary provided the patient gives a history of having been delivered of a full term live child and the child continued to live. In cases where a history is given of still births or difficult operative deliveries or where after a live birth the child died in the neonatal period it is very desirable to take the pelvic measurements. In some cases where abnormalities might have arisen in between two pregnancies consequent upon certain diseased conditions or accidents such as the development of osteomalacia or the occurrence of fracture of the pelvis it is obvious that pelvic measurements are necessary.

MANAGEMENT OF THE FIRST STAGE

HAVING done all the preliminary examination the obstetrician should now be in a position to know whether the patient is having real pains or not. The signs and symptoms of true labour are —

- (1) The occurrence of labour pains simultaneously with contractions of the uterus. The pains are generally felt in the back and transmitted towards the front and lower part of the abdomen.
- (2) The occurrence of the show. This is a discharge of mucus often mixed with blood due to the separation of the mucous plug filling the cervix the blood coming from the surface left bare by the separation of the membrane.
- (3) The presenting part is now fixed in a multipara.
- (4) An internal examination reveals that the cervical canal is dilating.

In the absence of any evidence of dystocia due to maternal or foetal causes the attitude of the obstetrician should be one of watchful expectancy. The patient should be allowed to walk about in the first stage as it materially assists in dilating the os and fixing the head. Towards the end of the first stage when the os is nearly fully dilated and the membranes are about to rupture the patient should be placed in the dorsal position or the lateral recumbent position. Should rupture of the membranes occur when the patient is in the erect posture there is a greater possibility of prolapse of the cord or some small part of the foetus if the head is not already fixed. During the first stage it is not absolutely necessary for the obstetrician to stay by the bedside except in a multipara and in cases where the contractions are severe and

occurring at very frequent intervals in a primipara but as soon as the membranes rupture he ought to be within easy call

During the first stage the patient should be encouraged to take small quantities of liquid nourishment at intervals such as plain milk broth soup fruit juice etc It is better to avoid any solid food because if the patient is given an anæsthetic it is likely to cause nausea and vomiting The patient should be encouraged to lie down quietly and have a good sleep and if labour starts at night it is well to give her a mild hypnotic so as to avoid a sleepless night As the uterine contractions increase in severity the membranes will bulge and usually rupture spontaneously when the cervix is fully dilated

When should the Membranes be Ruptured Artificially?
In normal cases there is no necessity for rupturing the membranes artificially but conditions may arise when it is desirable to do so Such conditions are —

- (1) When the cervix is fully dilated and the bag of waters remain entire owing to tough membranes
- (2) Where the lag of membranes is actually preventing at the outlet there is no object in allowing it to remain intact if the head is already fixed
- (3) In some cases of antepartum hæmorrhage rupturing the membranes controls bleeding
- (4) As a method of induction of labour
- (5) As a preliminary to operative delivery

MANAGEMENT OF THE SECOND STAGE

This stage begins when dilatation of the os is complete and ends with the complete expulsion of the fœtus or fœtuses

Care must be taken to see that the bladder is not distended and that the patient is encouraged to pass urine It is not desirable to give an enema at this stage for reasons already mentioned

During this stage the patient should be put to bed and towards the end of it when the expulsion of the fœtus is approaching the patient is placed either in the dorsal or left lateral position which ever position the obstetrician in charge is accustomed to

As the second stage is approaching completion the patient should be encouraged to bear down during the pains she should be instructed to hold her breath and bear down as a contraction reaches its height

The foetal heart should be taken every fifteen minutes after the rupture of the membranes The time when the membranes rupture should be carefully noted and the duration of the second stage should not be allowed to become unnecessarily prolonged without

carefully re-examining the patient and ascertaining any abnormal factors that may be responsible for the delay.

In the ordinary course of a normal labour this stage does not exceed two to three hours. The pains become more frequent, they last much longer, and towards the end of the second stage the bearing down pains commence. At this time the head presses against the perineum and the anus begins to dilate. It is now that the obstetrician should give the necessary assistance. The most important part in the management of the second stage is the prevention of perineal lacerations. By avoiding such perineal lacerations the puerperium will be rendered safer, as possibilities of

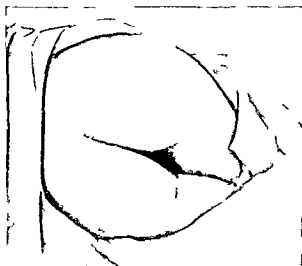


FIG. 46.—Left lateral position

sepsis are distinctly less where the perineum is intact, and the number of gynecological complaints at a later stage will also be reduced.

The causes of perineal lacerations are —

- (1) Relative disproportion in size between the presenting part and the vaginal outlet (soft parts)
- (2) Too rapid expulsion of the presenting part so that enough time is not allowed for gradual stretching of the perineum
- (3) Faulty mechanism whereby a larger diameter of the presenting part emerges through the outlet

It will thus be seen that what we should aim at in trying to save the perineum is —

- (a) To prevent too rapid expulsion
- (b) To preserve the normal mechanism of delivery, and
- (c) To deliver the presenting part in between the pains

To prevent too rapid expulsion of the head, the patient should now be induced to refrain from bearing down, to breathe deeply *during the pains*, and to cry out *during the emergence of the head*. At this stage a light anæsthetic may be invaluable, as it relieves the patient of the most excruciating pains of delivery and helps the more gradual progress of the head. If there is a tendency for the head to advance too rapidly, counter pressure should be applied to prevent it from slipping out suddenly.

To promote normal mechanism of delivery and thus favour the smallest diameter of the head to emerge through the outlet it is necessary to see that extension of the head does not occur till

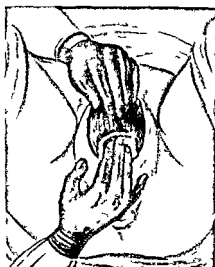


FIG. 47.—Method of delivery of the head avoiding undue stretching of the perineum

the occipital protuberance emerges from underneath the symphysis pubis.

The delivery of the head between the uterine contractions is distinctly advantageous in that with a relaxed perineum it is easier to lever out the head gradually and thus control its progress at the outlet much more successfully.

HOW TO SAVE THE PERINEUM

From what has been stated already it will be obvious that whatever method is adopted to save the perineum it should aim at the three important precautions enumerated above. If the patient is put in the left lateral position the obstetrician stands behind and passes the left hand and forearm between the thighs of the patient, and uses the fingers of this hand to prevent the

sudden exit of the presenting part and also to assist the normal mechanism of delivery by keeping the occiput pressed posteriorly till it is well underneath the symphysis pubis and till the pelvic floor is sufficiently stretched. At the same time with two or three fingers of the right hand placed on the protruding head and without touching any part of the maternal tissue he controls the movement of the head in such a way that it may distend the perineum gradually as it is born. Both hands are used to prevent a too rapid advance of the head and so regulate the rate at which the head stretches the perineum and is delivered. It is desirable that a little chloroform or ether be given on a mask at this stage or as an alternative the

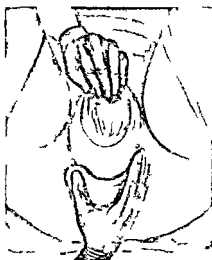


Fig. 48. Method of preventing the perineum

patient should be asked to open her mouth and breathe deeply or cry out and so not strain as the head is distending the perineum. An alternative method is where the thumb and fingers of the right hand are placed on either side of the coccyx and the presenting part is pushed up as close to the subpubic ligament as possible thus making use of all the available space of the pubic arch. In some cases it may be found impossible to prevent lacerations of the perineum. This may be either in operative deliveries or occasionally even in normal deliveries. The outlet may be

so narrow and the perineum may not stretch sufficiently to allow the head to be born without a tear.

If a tear is inevitable the greatest precaution should be taken to see that it does not extend into the rectum and that it is not an irregular bruised laceration of the perineum. To avoid such a contingency an operation is performed which is known as *episiotomy*. This consists in cutting through the perineum with a pair of scissors. Episiotomy may be either lateral or central. In lateral episiotomy an incision is made into the perineum to one side of the median line and directed away from the rectum. A lateral episiotomy may be done on one side or both sides. Usually it is not desirable to perform it on both sides. In some cases a central episiotomy may be preferred. This has the advantage that it does not cut across the muscular fibres of the pelvic floor but care must be taken to see that this incision does not extend into the rectum and as such central episiotomy should be performed

only in those cases where a slight tear of the perineum is likely to result and where it is desirable that the tear should be a clean cut rather than a bruised laceration. In lateral episiotomy any slight extension is not of much consequence as from the direction of the episiotomy wound any extension will be further away from the rectum.

After the delivery of the head the eyelids of the child should be cleaned by means of soft linen soaked in sterile water or boric acid solution. separate wipers should be used for each eye and the lids washed. A piece of gauze should then be taken to wipe

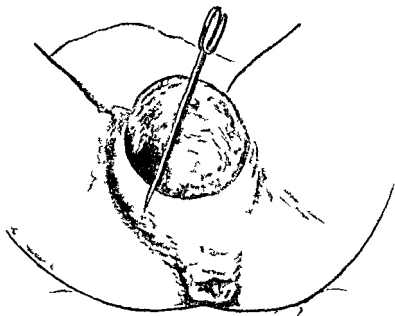


FIG. 49.—Lateral episiotomy

the lips and nose and the little finger wrapped with a piece of moist linen should be passed into the child's mouth and any accumulated mucus removed therefrom.

The next step is to find out whether the cord is round the neck. If it is round the neck there are three methods of releasing it —

- (1) The loop of the cord may be drawn down and slipped over the head.
- (2) If the cord is more than once round the neck it may be clamped and cut between two artery forceps and the cord separated from the neck.
- (3) The loop of the cord may be pushed up and allowed to slip over the shoulders and the head delivered.

DELIVERY OF THE SHOULDERS

After the head is born it is better to wait for the next pain to expel the shoulders naturally. During this interval the movements of restitution and external rotation will take place. The anterior shoulder will then lurch against the symphysis pubis, and the posterior shoulder will be born. It is necessary to take care of the perineum during the delivery of the shoulders, as in



FIG. 50.—Delivery of the shoulders in a vertex presentation

some cases either because of a rapid delivery, or because of an increase in the size of the bisacromial diameter, the perineum is lacerated. Delivery of the shoulders should be delayed till complete rotation of the bisacromial diameter has taken place. The head should be held in the hand and gently depressed downwards so as to get the anterior shoulder well underneath the symphysis pubis. It should then be gently raised up so as to allow the posterior shoulder to be delivered first. As far as possible, delivery of the shoulders should be helped by traction of the head upwards for the posterior shoulder, and traction downward for the anterior

PERINEAL LACERATIONS

Once the child has been removed to the cradle the perineum should be carefully examined with the patient in the dorsal position to note any lacerations. It is not sufficient to examine only the skin, as deep lacerations may sometimes be present which it is always desirable to suture immediately after the labour is over.

Where lacerations are present, the question of the repair of the perineum should be considered. In some cases it may be desirable to perform this after the expulsion of the placenta. On the other hand, should the patient already be under the effects of chloroform it is much better to apply sutures to the perineum before the patient comes round. We have rarely found any difficulty in suturing the

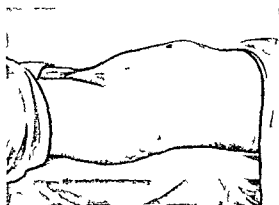


FIG. 54—The third stage of labour

Note the slight elevation due to the expulsion of the placenta into the lower uterine segment

perineum and expressing the placenta later but should the vulval outlet be very narrow and difficulties anticipated the sutures may be placed *in situ* and only tied after completion of the third stage.

Immediately after the expulsion of the child an antiseptic dressing should be applied over the vulval outlet after preliminary cleaning, and this dressing is retained till signs of separation of the placenta are manifest.

MANAGEMENT OF THE THIRD STAGE

By far the most important stage of labour to manage in a case of normal delivery is the third stage. A careful watch should be kept over the condition of the uterus, the condition of the patient, the amount of hæmorrhage, if any, and the signs of separation of the placenta.

How to ascertain if the Placenta has separated. The

CREDÉ'S METHOD OF EXPRESSION OF THE PLACENTA

When the signs of separation of the placenta are manifest, that is, when the placenta is lying in the lower uterine segment, an attempt may be made, if it is not naturally expelled, to express it. The reason why the placenta may not be naturally expelled is because the uterine contractions are not sufficiently forcible to project the placenta outside the vulval outlet. Hence it may

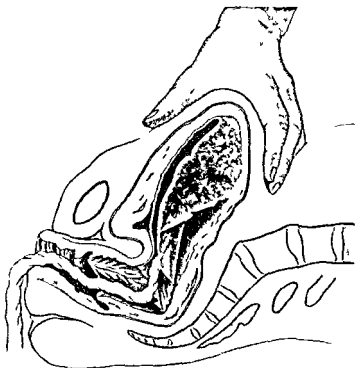


FIG. 55—Credé's method of expression of the placenta. Section

sometimes be retained in the somewhat dilated and relaxed lower uterine segment. To promote proper expulsion of the placenta the uterus must be made to contract and the fundus should be firmly grasped in the palm of the hand and gently pressed downwards and backwards towards the pelvis. When the placenta appears at the vulva little or no traction is necessary, but it should be received by an assistant, grasped firmly and gently rotated on its axis, so that the membranes are twisted into a rope and so gradually removed. If there is any danger of the membranes tearing it is well to catch hold of them with a pair of artery forceps and by light traction up and down to cause them to be expelled. In some cases it is desirable repeatedly to catch hold of the membranes

following signs and symptoms help to assist one in determining whether the placenta has separated from the uterus or not —

- (1) The patient will complain of pains associated with uterine contractions
- (2) There will be a slight amount of vaginal hæmorrhage
- (3) The extra vulval portion of the cord will lengthen
- (4) The fundus of the uterus will rise above the umbilicus
- (5) There will be a soft elevation above the symphysis with a depression immediately above indicating that the placenta has separated from the fundus and is lying in the lower uterine segment
- (6) If the fundus of the uterus is gently grasped and raised the cord will not recede if the placenta has separated, whereas if the placenta is still adherent to the uterus the portion of cord just outside the vulva will be drawn into the vagina

There is generally a tendency to hasten the completion of the third stage. This should be avoided and it should be clearly realised that the temporary suspension of the uterine contractions following the expulsion of the fœtus is a physiological condition and should not be disturbed.

The *common mistakes* committed in the management of the third stage of labour are —

- (1) Undue haste and rough manipulation in the completion of the third stage
- (2) Premature attempts at expression of the placenta
- (3) Neglect to ascertain whether the bladder is empty or full
- (4) To attempt expression of the placenta without provoking uterine contractions and without expressing in the proper direction namely, downwards and backwards
- (5) Irregular stimulation of the uterine contractions when the uterus should be in a condition of rest
- (6) To attempt to deliver the placenta without care being taken to see that the membranes are expelled entire
- (7) Sufficient care may not be taken to avoid the possibility of sepsis in receiving the placenta

The chief objects in view during the management of the third stage are to promote natural separation of the placenta and membranes and their complete expulsion, to arrest hæmorrhage and to secure good and permanent contraction and retraction of the uterus.

CREDÉ'S METHOD OF EXPRESSION OF THE PLACENTA

When the signs of separation of the placenta are manifest that is when the placenta is lying in the lower uterine segment an attempt may be made if it is not naturally expelled to express it. The reason why the placenta may not be naturally expelled is because the uterine contractions are not sufficiently forcible to project the placenta outside the vulval outlet. Hence it may

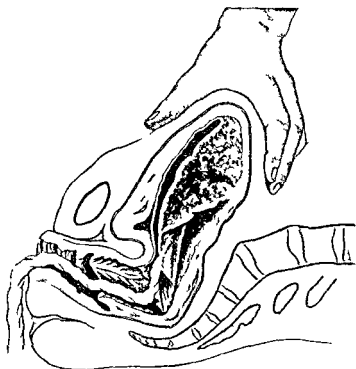


FIG. 55.—Credé's method of expression of the placenta. Section

sometimes be retained in the somewhat dilated and relaxed lower uterine segment. To promote proper expulsion of the placenta the uterus must be made to contract and the fundus should be firmly grasped in the palm of the hand and gently pressed downwards and backwards towards the pelvis. When the placenta appears at the vulva little or no traction is necessary but it should be received by an assistant grasped firmly and gently rotated on its axis so that the membranes are twisted into a rope and so gradually removed. If there is any danger of the membranes tearing it is well to catch hold of them with a pair of artery forceps and by light traction up and down to cause them to be expelled. In some cases it is desirable repeatedly to catch hold of the membranes

nearer and nearer the vulval outlet as they are pulled downwards and thus ensure that the membranes are expelled entire

Examination of the Placenta and Membranes As soon as the placenta has been expelled it is received in a basin with water and the placenta and membranes carefully examined. The uterine surface of the placenta should first be examined to see that the cotyledons lie in close apposition. There should be no defect on the uterine surface at the grooves between the cotyledons or at the margin of the placenta. The membranes are then

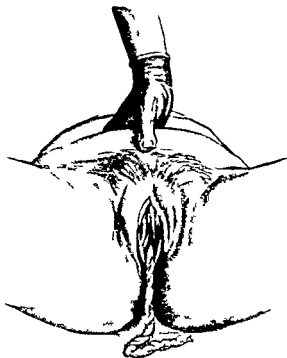


FIG. 56.—Creb's method of expression of placenta

examined carefully to see that both the amnion and the chorion are entire. Any small defects in the membranes should be carefully noted as they may be due to the retention of a succenturiate lobe of the placenta.

Retained Placenta or Membranes If portions of the placenta or membranes are retained the twin danger of hæmorrhage and sepsis may result. Any large bits of placenta should undoubtedly be removed immediately by careful intra uterine manipulation with the fingers. Where however there is some doubt whether a small bit of membrane or only a small piece of placenta has been retained it is safe to adopt an expectant plan of treatment as in the large majority of instances the piece of

membrane is separated and passed in the lochia on the third or fourth day of the puerperium. On the other hand an intra uterine manipulation to remove this piece is bound to increase the risks of sepsis.

As soon as the placenta has been completely expelled the patient—particularly if she is a multipara—is given an *ecbolie* $\frac{1}{4}$ to 1 drachm of *extractum ergotæ liquidum* or 1 c.c. of ergotine hypodermically. In some cases where there is a tendency for hæmorrhage an injection of the extract of pituitary may also be



FIG. 57.—Third stage of labour. Method of receiving the placenta.

given. The uterus is massaged and firmly controlled and any clots retained may be expressed and the patient watched by carefully noting her pulse rate.

Repair of the Perineum. Lacerations of the vagina and perineum should now be carefully sutured with the appropriate sutures if this has not already been done.

After the completion of the third stage the external genitalia should be carefully cleansed with sterile water or with an antiseptic lotion—bichloride of mercury or any other suitable antiseptic. The cleansing should include the thighs, buttocks and the lower parts of the abdomen since these are usually soiled by blood, etc. If there are abrasions or slight lacerations the parts may be touched

with an antiseptic, such as tincture benzoin, tincture iodine or mercurochrome. A sterile or antiseptic pad of some absorbent material should be applied to the vulva and held in position by means of tapes attached thereto, which are tied at the waist, or fixed by safety-pins to the abdominal binder. This antiseptic pad should be changed as often as it becomes soiled—certainly every four hours on the first two or three days. The patient should have an abdominal binder applied. This is a great comfort to the patient

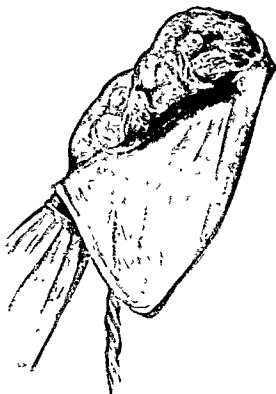


FIG. 58 —Examination of the placenta—maternal surface

and helps to keep the uterus compressed and the intestines from getting distended because of the sudden release of intra-abdominal pressure. The abdominal binder may be continued for some weeks after parturition, as in many of these patients undue laxity of the abdominal wall results if a support is not available. The obstetrician should watch the patient for at least an hour after completion of the third stage, and only then if everything is satisfactory should he leave the place.

Care of the Baby. Once the patient has been made comfortable the care of the baby should be the next concern of the obstetrician or the midwife attending. The baby should be given

a bath after the body has been smeared with oil preferably olive oil. The vernix caseosa can then be easily washed off. After the bath the child should be carefully examined for any abnormality in particular note if the anus or the urinary meatus is imperforate or if there are extra fingers or toes cleft palate harelip club foot spina bifida etc. The cord should be carefully dressed again after the bath and a light dress put on.

The patient should be settled in bed two hours after delivery if she has been on a delivery board and kept in a well ventilated room and protected from draughts. She should be allowed to have a comfortable sleep at this stage after giving her some light nourishment such as a cup of warm milk cocoa or other liquid nourishment. Visitors should be restricted and as much quiet as possible ensured.

SECTION II

PHYSIOLOGY OF THE PUERPERIUM

CHAPTER XIII

THE PHENOMENA OF THE NORMAL PUERPERIUM

This is the period which begins with the termination of the third stage of labour and extends to the time when the genital organs have assumed their normal condition again. It is no doubt true that once a delivery has taken place the genitalia cannot return to the same condition as before pregnancy.

The normal duration of the puerperium is from six to eight weeks although in its more restricted sense it covers the period of ten to fourteen days immediately after delivery, during which the more radical changes take place.

The changes that occur during this period are —

- (1) Changes in the uterus
- (2) Changes in the cervix, vagina and external genitalia
- (3) Changes in the breasts

Changes in the Uterus The most striking feature about the puerperium is the change that takes place in the uterus. Immediately after delivery the uterus is hard very much reduced in size and the fundus is generally felt about the level of the umbilicus that is 4 to 5 ins. above the symphysis pubis. During the puerperium the uterus gradually diminishes in size, and by the tenth or twelfth day it can no longer be felt by abdominal palpation. This process is known as *involution* of the uterus. The uterus never actually returns to the original state, and in a parous woman it always remains a little bigger and more freely movable than in a nullipara. The rate of involution of the uterus varies with different individuals but should generally be progressive from the first day onwards. In certain cases, as in anæmic women and in conditions associated with puerperal sepsis, involution of the uterus may be retarded. In some cases the uterus may be pushed to the left side or the other and involution may be interfered with

due to collection of lochial discharge in the cavity. Retarded involution, fatty degeneration of the muscular fibres of the uterus and the fat is removed by the lymph stream after autolytic

digestion. The vessels of the uterine wall become closed by thrombi. The closure is considerably helped by the contraction and retraction of the uterine musculature. Eventually the blood clot in the lumen of the vessels becomes absorbed and the vessel walls are then represented by a solid or thinly canalised mass of hyaline tissue.

After delivery the endometrial surface of the uterus is thick and rough. Degenerating decidua, blood clots and bits of fetal membrane may be present. Gradually these undergo fatty degeneration and are generally cast off in the lochial discharge. After the larger part of the surface has been thus shed, regeneration takes place from the connective tissue remains of the mucous membrane and from the epithelium of the deepest portions of the uterine glands. The process closely resembles that of the healing of a granulating surface on a mucous membrane. The regeneration generally begins about ten days after labour and is complete in about a month except over the placental site.

During the puerperium a discharge is present which is known as the *lochia*. It consists of blood and decidual membrane and occasionally bits of fetal membrane and clots. The lochia is generally red for the first three days and later becomes pink, gradually becoming pale. It lasts for ten to twelve days and may return again after two or three weeks when the patient attempts to move about freely.

The quantity of the discharge varies with different individuals. Generally the number of diapers stained during the twenty-four hours gives an approximate idea as to the quantity of lochia passed. In some pathological conditions, such as anemia, the lochia may be very scanty. In cases of retroflexion of the puerperal uterus the lochia may be retained and decompose. Occasionally in certain septic conditions, particularly septicaemia, there may be suppression of lochia. The lochia may on the other hand be increased in quantity in cases where there has been a large placental site as in twins and also in cases of sepsis.

Other points to be noted about the lochia are its colour, odour, quality and method of staining on the diaper. The colour varies with the period of the puerperium, and as has been stated above, usually it is bright red for the first two or three days, pink for the next three days, gradually becoming pale subsequently. Ordinarily healthy lochia has got a sweetish mawkish odour but if saprophytic organisms have gained admission the smell may be very offensive.

By the quality of the lochia is meant its composition. In some cases where bits of membranes or of placenta are left behind the degenerating membrane or placenta may be found in the lochial discharge. Not infrequently degenerating blood clots may also

be expelled If the tissues have been damaged, sloughs from the cervix or the vagina may be passed

The method of staining on the diaper must be noted Healthy lochia stains more deeply in the centre than at the edges while if it is unhealthy and decomposing the edges are more deeply stained than the centre In healthy lochia the deeper staining at the centre is due to the deposit of the heavier corpuscular element while the serum exudes to the peripheral area and stains less deeply in unhealthy lochia on the other hand the corpuscular element is decomposed and the edges tend to stain more deeply and so there is usually more uniform staining

Changes in the Cervix, Vagina and External Genitalia The cervix also participates in the general involution of the uterus and its canal gradually becomes smaller and smaller The cervix, however never returns to the non gravid state the external os of the cervix being always patulous in a multipara while it is closed in a nullipara

The vagina takes some time to recover from the distension to which it was subjected The vaginal outlet is markedly relaxed and signs of laceration may be noted The hymen completely disappears as such and its place is taken by a number of small tags of tissue which cicatrize and are known as carunculae myrtiformes This is a characteristic sign of child birth

The perineum is also relaxed, the degree of which depends upon whether it has been lacerated or not during the process of delivery

The pelvic floor is stretched during the process of delivery, and if deficient in elasticity will be found relaxed Gradually there is a regain of tone, but a certain amount of gaping of the vulva usually remains in a parous woman ✓

Changes in the Breasts After delivery, lactation is established in the breasts and the mother is now in a position to continue the nourishment of the child Unlike mammals milk is not secreted by the mother till the second or third day of the puerperium For the first twenty four hours and sometimes for forty-eight hours following delivery a thin secretion is available from the breasts which is known as colostrum The breasts become larger fuller the veins become more prominent and the patient has the feeling that the secretion of milk is beginning If the child is put to the breasts regularly the milk begins to be secreted gradually in increasing quantities The colostrum that is secreted within the first twenty four hours is of a deep yellow colour, alkaline in reaction and if a drop of it is examined under the microscope it will be found to consist of fat globules a watery fluid and some corpuscles known as colostrum corpuscles These corpuscles are round ovoid or stellate cells which contain one or two nuclei Colostrum contains very little if any, casein but a great proportion

of lactalbumin and lactoglobulin with much fat. It has a slight laxative action on the new born baby and helps to clear the meconium from the intestines.

The milk that is secreted after forty-eight hours differs from the colostrum. Human milk is an opaque slightly yellowish liquid with a sweetish taste and a characteristic odour and is slightly alkaline in reaction. The specific gravity varies between 1020 and 1035. The composition also varies, but generally the average analysis results are as follows —

Water	87.3 per cent
Proteins	2.0
Fat	3.5
Sugar	7.0
Salts	0.2

The quantity of milk secreted varies with individuals and with the race. Thin women have a more abundant supply of milk than fat and flabby constitutions. Nervous women naturally produce less milk. The secretion is influenced by various factors among which may be mentioned diet, mental emotions, drugs, menstruation and pregnancy. Emotions may alter the quality and quantity of milk. The milk gradually dries up if another pregnancy starts during lactation and if the woman is menstruating the milk may have an adverse effect on the child and may cause diarrhoea, intestinal colic, etc.

Certain drugs may be secreted through the milk and thus affect the infant. Prominent amongst these are cathartic purgatives, alcohol, opium, iron, arsenic, iodine, lead and mercury. In diseased conditions of the mother the secretion of milk is very likely to be diminished or suppressed, particularly in acute illnesses, in diarrhoea, dysentery, tuberculosis, etc. Certain foods and drugs are supposed to increase the quantity of milk. These are said to be galactogogues. It is a common thing for mothers to be given fish, tomatoes, gruels and plenty of milk. Overfeeding, however, may occasionally dry up the breast by increasing the fat. Fever during the puerperium may decrease the quantity of milk. The secretion in the breasts may be re-established by proper massage and by putting the child to the breast at frequent intervals. The amount of milk secreted varies with the demand and with the individual. Usually about two to three pints per day are secreted.

Changes in the Abdominal Wall and Peritoneum. Synchronous with the changes that take place in the uterus and vagina, the pelvic peritoneum and the structures of the broad ligament accommodate themselves to the changed conditions. The stræ gravidarum do not disappear. As a result of the continued distension during pregnancy the abdominal wall remains flat and flabby for some time. A certain amount of this laxity and flabbiness

will remain permanently unless proper exercises for the abdominal muscles are persevered with. Occasionally divarication of the recti muscles is met with so that one can easily pass a hand in the median line between the two recti and palpate the abdominal contents. Here again proper exercise and massage will help to regain the tonus of these muscles.

CHAPTER XIV

THE CARE OF THE PUERPERIUM

THE care of a pregnant woman does not end with the delivery of the child and the conclusion of the third stage. In fact both for the immediate and the ultimate prognosis a good deal of care is required during the puerperium if the patient is to escape the immediate risks and at the same time not predispose herself to many of the remote gynecological troubles associated with neglect during the puerperium.

We may describe the care of the puerperium under two heads —

- (1) Immediate care after labour is over and
- (2) The subsequent care during the remainder of the puerperium

IMMEDIATE CARE AFTER DELIVERY

In the chapter on the conduct of labour we have dealt with the steps that ought to be taken for the mother and the child up to the completion of the third stage of labour. After careful examination of the placenta to make sure that it is complete observations are made of the mother's pulse the condition of the uterus and any tendency to hæmorrhage. Two to four hours after the end of the third stage if progress is favourable and the uterus is firmly contracted and there is no tendency to hæmorrhage the patient can be removed from the delivery board to a bed. Before so doing a toilette of the vulva is essential. The external genitalia are washed with an antiseptic lotion—1 in 2000 perchloride of mercury or dettol or any other suitable antiseptic. If the perineum has been torn and subsequently sutured particular care should be taken to see that it is properly washed dried painted with an antiseptic such as mercurochrome tincture benzoin co. or tincture iodine etc. and then a sterile vulval pad made of cotton wool wrapped in a piece of gauze is applied over the genitalia. Such pads are available on the market as sanitary pads and it will be well for the patient to have a liberal supply during the whole of the puerperium. The pads should be changed every three or

four hours and every time after urination or defecation. At each change the genitalia should be cleansed using fresh cotton pledgets soaked in antiseptic solution care being taken to see that the parts are washed from above downwards and never from below upwards.

Binder It is our custom to apply an abdominal binder for the first twenty four to forty eight hours. Controversy has arisen as to the value of an abdominal binder. Extreme opinions are held and it has been suggested that the abdominal binder far from being useful is a hindrance to the proper exercise of the abdominal muscles and should accordingly have no place in the treatment of the puerperium. While the continued use of the binder may possibly favour the patient lying in bed too long and not exercising her abdominal muscles we feel that for the first twenty four to forty eight hours it serves a definite purpose. It gives a feeling of support to the mother and if properly applied will help to control the uterus and prevent it from getting distended with clots. After forty eight hours it should be removed and the patient encouraged to exercise her abdominal muscles.

After-pains In some cases the patient complains of very severe pains which may be more painful than the labour pains that she experienced. After pains are more likely to occur in multiparae in women who have had a precipitate labour and in primiparae where the uterus was overdistended and in cases where clots have been left inside the uterus. The pains are due to lack of tonus of the uterine muscle and if severe they may keep the patient awake and cause her much discomfort. It is best under these circumstances to give the patient morphia or any other hypnotic such as one of the barbituric acid preparations.

CARE DURING THE SUBSEQUENT PERIOD OF THE PUERPERIUM

Following the delivery the patient should be visited every day for the first eight or ten days and the following points should be noted —

- (1) General condition of the patient
- (2) Temperature, pulse, respiration
- (3) Sleep
- (4) Rate of involution and condition of the uterus
- (5) Lochia its nature and quantity
- (6) Condition of the bladder.
- (7) Condition of the bowels
- (8) Condition of the breasts

Simultaneously with the attention paid to the mother the child should also be examined and the condition of the umbilical cord the condition of the bowel and the bladder general condition

its nourishment and weight should be noted. These points will be elaborated in the chapter on the care of the new born baby.

So far as the mother is concerned proper care of the puerperium consists in attending to the details mentioned above.

Rest It is important to realise that a woman after labour is exhausted and complete rest is essential. In fact it is wise during the first week to restrict all visitors and allow only the intimate members of the family to see the patient at definite hours. Immediately after labour and when the patient has been settled in bed she generally goes off to sleep and awakens most refreshed. While the patient should be given plenty of rest it is at the same time necessary to realise that she should not be confined to bed too long. In a normal case it is well to prop up the patient in bed on the third day to allow her to sit up on the fifth day and let her walk about round the bed on the seventh day. The patient will be in a fit condition if everything has gone on satisfactorily, to be allowed to move about freely from the tenth day onward. However in cases of instrumental delivery, or where any complications are present obviously the period of rest must be prolonged and it will depend upon the condition of the patient as to when she can be allowed to sit up. Particularly in cases of postpartum hæmorrhage it is desirable to prolong the period of rest and not to allow her to get up too soon. Cases are on record where an attempt to sit up in bed early has resulted in pulmonary embolism and sudden collapse.

In the tropics it is exceedingly difficult to persuade women to stay long in bed owing to financial considerations and the lack of proper assistance at home and it is not infrequent for the patient to be discharged from hospital on the fifth or sixth day of the puerperium. On the other hand a too prolonged stay in bed is equally undesirable. It produces the impression of serious illness in the patient and her relative and the necessary movements essential for the proper involution of the uterus and the free flow of the lochia, as well as the proper exercise of the muscles both of the abdominal wall and of the pelvic floor, cannot be obtained unless the patient is allowed to sit up on the fifth day.

Diet The old idea that a very limited diet should be given to the puerperal woman and that it should largely consist of liquid diet is no longer held. Immediately after delivery and probably for the first forty-eight hours it is desirable to limit the diet to liquid nourishment. Once the bowels have moved freely the diet may be more generous—solid being introduced in the shape of toast or blancmange on the third day, and the ordinary diet allowed on the fifth or sixth day.

Temperature One of the most important things to watch carefully is the temperature. The normal puerperium should be

Pyrexia The temperature should be recorded at intervals of every four hours and any rise above 100° should be especially noted. It is not infrequent for a slight rise of temperature to be present within the first twenty-four hours after delivery; occasionally the woman may even get a chill with rigor and the temperature shoot up to 101° to 102° . Generally however within twenty-four hours the temperature comes back to normal and keeps normal. Any rise of temperature thereafter must be viewed with suspicion and it should be presumed that every such rise is due to septic causes uterine or urinary unless this can be satisfactorily eliminated. Particularly in the tropics there are many other conditions which may give rise to pyrexia in the puerperium. Several tropical diseases such as malaria, kala-azar, amebiasis, dengue, influenza may occur besides the more common of the diseases like tuberculosis, enteric pneumonia are not infrequent. Even so the presumption should always be in favour of the possibility of septic infection till every attempt has been made to disprove its presence.

Pulse During pregnancy and in the puerperium a physiological bradycardia is not uncommon. A rise in the pulse rate is a more sensitive index of abnormality than even the temperature. If the pulse rate is above 90 the attention of the physician should be drawn to it. The relation between the pulse and the temperature is a factor to be taken into consideration. In severe cases of uterine sepsis the increase in the pulse rate will be found out of proportion to the rise in temperature. In cases where the temperature is due to other causes such as malaria etc. the pulse rate may not show any appreciable increase.

Respiration The frequency with which complications in the lungs may occur in the puerperium make it necessary to record the rate of respirations as well. The patient may have an attack of pneumonia or broncho-pneumonia or sometimes the complications in the lungs may be the sequelæ of septic conditions.

Bowels It is essential to take note of the state of the bowels. It is usual for the patient who has been healthy and moving about to become constipated when she suddenly takes to bed after delivery. It is an immemorial custom to give the patient a dose of castor oil on the third day after labour. Care must however be taken to see that the genitalia are well cleaned and protected after every evacuation of the bowels, and in cases where the perineum has been sutured it is better to avoid administering purgatives. Opinion is not altogether unanimous as to the desirability of giving a purgative during the puerperium and some obstetricians prefer to allow the bowels to move of their own accord in view of the possibility of septic contamination from a free purgation of the bowels if not properly dealt with. Occasionally

the bowels may be moved by enemata and thus is perhaps preferable in cases where the perineum has been sutured. The patient in some cases does get a rise of temperature owing to constipation and the consequent absorption of intestinal toxins and in such cases at least a brisk purgative is helpful as it not only eliminates the intestinal toxins but promotes the involution of the uterus and aids the bladder to empty itself.

Bladder The care of the bladder is important in the puerperium. In some cases of natural labour but more frequently after operative deliveries the bladder does not empty itself freely or completely. This is more likely to occur if there has been any laceration of the perineum or urethra or clitoris. In such cases if care is not taken the bladder becomes overdistended and as a consequence presses upon and tends to promote backward displacement of the puerperal uterus. Such a displacement causes retention of lochia a condition known as *lochometra* which may later owing to pyogenic organisms gaining admission become a *pyometra*. A vicious circle is thus set up. Accordingly in the early days of the puerperium the utmost care should be taken to see that the bladder empties itself. At the same time it should be possible to favour emptying of the bladder without resort to catheterisation. In spite of all the care that may be taken passing a catheter carries an element of risk of introducing sepsis into the bladder. A good method of favouring the emptying of the bladder is gently to massage the lower part of the abdomen and then pour some hot water over the genitalia while the woman is propped up in bed. If the bladder does not empty itself freely an injection of pituitary extract $\frac{1}{2}$ c.c. may possibly be of help. Failing these catheterisation is necessary but should be done with all due aseptic care. If frequent catheterisation has to be resorted to it is well to put the patient on urinary antiseptics for a few days.

Involution of the Uterus It has already been stated that the uterus gradually involutes during the puerperium. Immediately after labour the fundus of the uterus is at the level of the umbilicus or one or two fingers below. Occasionally the uterus may be displaced to one side or the other—more often to the right in which case it is well to bring it to the median line and to ascertain the height of the fundus above the symphysis pubi. The most important thing to note in the puerperium is the rate of involution of the uterus. Occasionally on the second or third day the uterus may not be palpable as an abdominal organ. This should at once arouse suspicion of the possibility of a backward displacement of the puerperal uterus. The height of the uterus should be noted on each day and should be charted so as to observe the gradual and progressive rate of involution. Before ascertaining the height of the uterus the bladder must be empty. A distended bladder will

push it up. In normal cases the uterus will be found to descend a finger's breadth with each day of the puerperium and by the tenth or twelfth day it should be a pelvic organ once more.

The Lochia At each visit the obstetrician should carefully examine the lochia. As previously mentioned the quantity the quality the odour the method of staining on the diaper and the presence of any abnormality in the discharge should be noted. The lochia is generally known as lochia rubra lochia serosa and lochia alba depending upon the colour. Usually for the first three days it is red and is called *lochia rubra* for the next three days it is more sero sanguinous and is called *lochia serosa* while after that it tends to become pale and is called *lochia alba*.

The lochia may occasionally be brown or even dark the result of decomposition. The smell of the lochia is said to be sweetish mawkish and any variations in the odour should arouse the suspicion of sepsis. Complete suppression of the lochia may be due either to retention or to suppression as in cases of septicemia. During the puerperium the diaper should be frequently changed particularly if the lochia is abundant and offensive and the parts well washed and protected whenever the diapers are changed.

Sleep The mother requires plenty of sleep during the puerperium. One of the earliest symptoms of sepsis or puerperal insanity is sleeplessness. The room must be quiet and shaded and care must be taken to see that the child does not disturb the mother during her periods of sleep. In most cases if the child be properly fed it is possible to avoid a feed in the middle of the night. A glass of hot milk the last thing at bedtime a well ventilated room complete quiet a careful and helpful demeanour on the part of the nurse attending her and freedom from worry over the child will all favour natural sleep. It is inadvisable to give the patient any sedative to promote sleep. In some cases where the woman is of a nervous temperament or has mental worries it may be desirable to give sedatives.

Breasts The proper time to commence care of the breasts is during the last weeks of pregnancy. If sufficient care has been taken to keep the breasts clean and have the nipples drawn out touched with spirit and protected no trouble should arise during the puerperium. Once the baby has arrived the nipples should be washed with boric lotion and dried before and after each nursing. The child should be put to the breast at regular

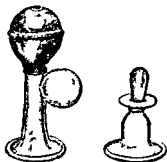


FIG 59—Breast relever and nipple shield

General Condition of the Patient The usual care taken of any patient confined to bed must be followed in cases of puerperal women. Daily sponging, care of the back, the groins and the axilla, plenty of fresh air and light, a cheerful atmosphere about the room and restriction of visitors are all desirable. As has been already stated the patient should be encouraged to sit up and move about without undue delay. She should be encouraged to exercise her limbs and abdominal muscles and if this precaution is taken she is not likely to feel the strain when she attempts to get up for the first time. Gentle diversion by way of light literature and pleasant conversation and freedom from worry favouring of good sleep particularly at night are all considerations to be borne in mind.

Postnatal Care

It is advisable at this stage to stress the need for postnatal care. Every woman who is confined should be examined two weeks after delivery. Particular care should be taken to see if there have been any lacerations of the vagina or perineum not previously recognised. Note is also made of lacerations of the cervix, the position of the uterus whether displaced backwards or laterally, whether it has completely involuted or there is any degree of subinvolution, whether there is inflammation of the pelvic cellular tissues or of the adnexa, whether the patient complains of any pain round about the groins or there is any evidence of subluxation of the joints. Such an examination will reveal the necessity for further treatment at a later stage and the patient should always be advised on this subject. If any damage is noted it is desirable to advise the patient to submit herself again for an examination at the end of six to eight weeks after delivery when there will be a better appreciation of the extent of the damage and the nature of the treatment required. The detailed management of the postnatal period has been separately dealt with in the Appendix.

CHAPTER XV

CARE OF THE NEW BORN CHILD

THE sudden transition from the protected environment of intra uterine life to the risks of extra uterine existence is beset with certain dangers to the new born child. Care is required therefore while it becomes acclimatised to its new surroundings and to the new methods of existence. The new born child has now to undertake for itself the functions of digestion respiration excretion

and maintenance of the general body warmth and the satisfactory establishment of these involves the observance of certain physiological principles

Care immediately after Delivery

As already described immediately after delivery ensure that the child breathes and cries out, that the umbilical cord is properly ligated and severed. The child is then wrapped in a warm towel or blanket and placed in the cradle till the third stage of labour is over. Thereafter the child should be examined in detail to note if there are any abnormalities present. It should then be properly cleaned. The body is covered with blood and vernix caseosa and to remove these it is best to smear it with warm oil such as olive oil or albolin which dissolves the vernix. Then the body is wiped with a soft towel. In the tropics it is preferable to give the child a warm bath. The cut end of the umbilical cord should be washed with an antiseptic solution and touched with a drop of tincture of iodine. Sterile gauze is then applied with a small bandage round the belly to keep it in position.

Care of the Eyes As soon as the head is born, and before the child can open its eyes the lids should be swabbed with pledgets of cotton wool soaked in boric lotion—a fresh piece of wool should be used for each eye. Further attention is necessary and is carried out during baby's initial toilet. The eyelids should be wiped with swabs soaked in boric lotion and the lids then properly opened so that a drop of 1 per cent solution of silver nitrate can be instilled into each eye as a prophylactic against gonorrhœal ophthalmia. It is wise to take this precaution in all infants born in institutions. In private practice, unless the obstetrician is sure that there is no possibility of gonococcal

Micturition The infant should micturate within the first twelve hours, if not, the parts should be examined to see if any congenital deformity exists. In the male a tight prepuce or congenital phimosis may be the cause. Occasionally the meatus may not be open, and it is necessary to pass a sterile probe to make it patent.

Care of the Umbilical Cord The umbilical cord, which has been dressed soon after birth, should be attended to every day. The binder should be changed whenever it becomes soiled and the dressings of the cord should be renewed daily. Usually the cord dries up and separates on the seventh or eighth day. Occasionally there may be some sign of inflammation. The cord must be allowed to drop off by itself and no attempt made to hasten separation by pulling on it.

The Weight of the Child During the first four days the infant loses weight, on an average about half a lb., for a normal baby weighing 6 lbs. A more rapid loss of weight is suggestive of some pathological condition. Breast fed infants lose less than infants fed artificially. After the first four days the infant should gradually gain weight. An excessive gain in weight in a short time is suggestive of some defect in feeding, such as overfeeding. Premature infants lose more weight relatively and are slow to regain it. The weight is perhaps the best index of the progress of the infant and should be estimated daily for the first fortnight and at least twice a week thereafter. The weight should be charted so that a graphic record may be available for ready reference.

Clothing Warm yet light clothing should be used. The extremities should be fairly free to allow of movements. The naphin should be applied and changed frequently.

Bath The child should be given a bath daily. This is certainly of importance in tropical countries. After the daily bath it is advisable to use a dusting powder, especially about the groins and the axillæ and the neck, to keep the parts dry and clean. It is useful to smear oil over the whole body before giving the child a warm bath.

Breast-Feeding

The most appropriate food for the baby is mother's milk, and in every case where it is possible breast feeding should be insisted upon. Six to eight hours after birth the child is put to the breast. The advantage of this is twofold. Apart from the maternal instincts thereby satisfied, the suckling of the child at the breast promotes better involution of the uterus and the colostrum ingested by the baby has a slight laxative effect. Before and after the child is put to the breast, it is necessary to clean the nipples. The time to be taken for each feed depends upon the ease and speed with which

the child gets the required amount of milk. It should be put to the breast at intervals of four hours except during the night for the first forty-eight hours and preferably the breasts should be used alternately. The nursing may last from ten to twenty minutes. The advantages of breast feeding are (1) mother's milk is best adapted to the digestive capacities of the child (2) the milk is sterile (3) it is a perfect food and supplies all the vitamins that are necessary (4) it confers some degree of immunity to infections on the child.

After the first forty-eight hours the child should be put to the breast at regular but more frequent intervals generally of three hours between 6 A.M. and 10 P.M. with if necessary one feed in the night. The mother must be impressed with the fact that the success of breast feeding depends upon the following factors —

- (1) Regularity of feeds
- (2) A definite time taken at each feed
- (3) The proper care of the nipples and the breast
- (4) The maintenance of an equable temperament with proper diet and adequate rest all needed for efficient lactation

Contra-indications for Breast-Feeding Under some circumstances breast feeding is contra indicated.

(1) Certain diseased conditions of the mother such as tuberculosis cardiac disease acute illnesses or contagious diseases severe grades of anaemia severe puerperal sepsis reproductive insanity

(2) Local conditions preventing breast feeding fissures of the nipple acute mastitis abscess of the breast defects of the nipples such as incurable retraction

Syphilis in the mother is not a contra indication to nursing. Indeed the syphilitic child stands in greater need of breast milk than a healthy child and as both the mother and child are infected there is no increased risk.

Sometimes breast milk may not agree with the child or may not prove sufficient. Deficiency in the quality or quantity of the milk may be due to several causes. Among these may be mentioned (1) general ill health of the mother (2) grave nutritional disturbances (3) defective development of the breasts (4) dietetic deficiencies (5) worry and mental emotions on the part of the mother or severe physical strain and exhaustion.

The quantity of milk secreted by the breasts does not depend upon the physical proportions of the mother. Spare women have got very efficient lactating breast whereas well proportioned and stout individuals often show a deficiency of breast secretion. Occasionally sucking may provoke such a free flow of milk that the child is incapable of suckling without getting suffocated.

Wet Nursing

A substitute for mother's milk may be obtained through a wet nurse. Care must be taken in the selection of a proper wet nurse and the points to be observed are —

(1) The wet nurse should be a person who has a baby about the same age as the infant to be suckled.

(2) Her breasts must be properly developed and she must have a sufficiency of milk.

(3) She must be free from any infectious or communicable disease. In particular care must be taken to see that she is not suffering from syphilis, and for this purpose we strongly advocate a Wassermann reaction being done.

(4) The diet of the wet nurse should be regulated and generally her life must be subjected to certain restrictions. She should not be addicted to alcohol, she must be of cleanly habits, must have an equable temperament and must be straightforward and honest.

The obvious difficulties of fulfilling the various conditions stated above are such that a wet nurse is usually not a practical proposition. Unless there is a relative who can look after the baby or a person of known character is available, it may be introducing a serious strain in the family life to allow a newcomer to bear the responsibility of looking after and feeding the newborn child. For these reasons methods of artificial feeding have come more into vogue and have supplanted wet nursing.

Artificial Feeding

There are certain conditions where artificial feeding may be necessary either because breast milk is not available or is not found sufficient for the purpose. Artificial feeding has now assumed great importance both because of the greater need for resorting to it and the new principles laid down in regard to the proper methods of feeding and the proper preparation of artificial foods. A detailed consideration of the subject is possible only in a text book on Pediatrics, but we refer here to some of the salient features.

By far the commonest available food which can be substituted for human milk is cow's milk. But cow's milk is not the same as human milk. It varies in certain important respects and so has to be modified suitably to make it approximate to human milk. The composition of cow's milk and human milk is as follows —

	Human milk Per cent	Cow's milk Per cent
Protein	2.0	4.0
Fat	3.5	3.5
Sugar	7.0	4.0
Salts	0.2	0.6

Besides these variations in composition it has to be noted that in cow's milk there is a heavy percentage of caseinogen which

forms a thick curd when mixed either with acid or with rennet and presents greater difficulties in digestion. It is to reduce the quantity of protein that dilution is indicated, and as this also results in further diminishing the quantity of sugar and fat it is necessary to add sugar in the form of cane sugar and fat in the form of cream to bring it approximately to the composition of human milk. It is not only in regard to dilution that care has to be taken but the milk has to be properly rendered sterile before being given to the infant. For this purpose there are three different methods of sterilising milk —

- (1) Sterilisation
- (2) Boiling
- (3) Pasteurisation

By sterilisation, which consists in continuous boiling for an hour or heating with superheated steam at a temperature of about 235° F all the bacteria pathogenic and non pathogenic, and their spores are destroyed, it is theoretically an ideal method of rendering the milk pure, but in practice it is not to be recommended as sterilisation not only destroys the bacteria but also the vitamins so essential for the proper growth of the infant.

Boiling, which consists in bringing the milk to boiling point, but not prolonging the process destroys the bacteria including the tubercle bacillus. It is a simple and safe method of rendering the milk bacterially pure. But it diminishes the activity of the antiscorbutic vitamin.

Pasteurisation consists in heating the milk to a temperature not exceeding 160° F for twenty to thirty minutes. It is said to destroy all organisms, except certain spore bearing ones. This seems the best method of preparing cow's milk because it kills the microbes but preserves the vitamins and for this reason it is generally recommended.

To dilute cow's milk, boiled water, barley water or lime water can be used. Another diluent not infrequently used is whey. The whey should be carefully prepared if it is to be of any value. If whey cannot be obtained, barley water has the advantage over plain water of rendering the curd more flocculent. In most cases a healthy infant is able to digest milk diluted with water and this perhaps is the simplest method of treating the milk.

When artificial feeding is resorted to great care is required in regard to—

- (a) The number of feeds per day
- (b) The proper dilution and preparation of cow's milk for different age periods
- (c) The quantity of diluted milk given at each feed
- (d) The choice of the feeding bottle and its proper sterilisation

As regards the *frequency of feeds* it may be stated that a healthy child may be fed at intervals of three hours by day and once in the night up to the third month, from the third month to the sixth month, at intervals of four hours, and later the feed at night may be given up.

The *dilution of cow's milk* at the different age periods should be as follows —

	Milk	Diluent
First four weeks	1	3
One to three months	1	2
Three to six months	1	1
Six to eight months	2	1
After eight months	3	1

The *quantity* of diluted milk given at each feed should be as follows —

During the first week the feed should be $1\frac{1}{2}$ oz

At the second week 2 oz

At the end of the sixth week $2\frac{1}{2}$ oz

At the tenth week 3 oz

And from this time up to the end of the eighth month the food should be at 1 oz per every month of age that is 4 oz at four months 5 oz at five months, and so on

The proper method of regulating the feeds is to take the calorific value of the feed and base it on the calorific requirements of the baby as judged by the body weight. The following table represents the daily calorific needs of an infant —

	1 lb. of body weight
Up to three months	45 to 50 calories
Three to six months	40 „ 45 „
Six to twelve months	35 „ 40 „

A good method of checking if the quantity of food given is sufficient, excessive or deficient is to record the weight and compare this with a normal weight curve charted for an average baby. If the curves run parallel and closely simulate each other it may be taken that the quantity of feeds given are near the amount needed. If the infant's curve falls below and lags behind the quantity of food will have to be increased. If the curve on the other hand, ascends markedly above the normal curve the quantity of each feed will have to be cut down.

Care of the Bottle Whatever may be the artificial food given to the baby, great care is necessary in the proper selection of the bottle and in its thorough sterilisation. The best bottle for infant feeding is the boat shaped pattern with openings at both ends so that it can be thoroughly flushed out and cleaned. The

nipple also should be properly selected so that it is not too soft or 'oo tough'. The flow should be graduated so that it will flow drop by drop almost continuously. The bottle and the nipple after thorough cleaning should be boiled and preserved in sterile water, ready for use whenever necessary. If the nipple gets sodden it should be changed. The sterilised milk and the boiled water should be kept covered and they should be diluted in proper proportion and warmed before being put into the feeding bottle. Any remains of a feed should be immediately thrown out and the bottle thoroughly cleansed.

Proprietary Foodstuffs

DRIED MILK

The use of dried milk has become very popular. It is generally prepared by passing a sheet of cow's milk over superheated metal by which process the milk is reduced to fine powder which is collected and stored in tins. There are certain advantages in the use of dried milk. It is sterile the nutritive value seems to be uninjured it keeps well and can be utilised where fresh cow's milk is not available or the quality of the milk is doubtful. Some of the vitamins are destroyed and for this purpose it may be necessary to add these in other ways. The disadvantages are (1) some of the vitamins are destroyed as stated above and (2) certain of the valuable properties of fresh milk more particularly mother's milk such as the power to increase immunity and resistance to infection are lost.

Examples of dried milk are Glaxo, Cow and Gate Food, Tru Food, Dryco etc.

OTHER PROPRIETARY FOODS

There are innumerable patent foods on the market which have not all the properties that are so elaborately advertised in their favour. They have their uses provided their limitations are borne in mind and they are used for short periods or with such precautions as may be necessary in each case. These foods may be divided into five categories—

(1) Those consisting of dried milk with the addition of completely malted cereals. *Examples*—Horlick's Malted Milk, Allenbury's Food 1 and 2. In these preparations the starch has been completely converted into soluble carbohydrates so that the infant is enabled to digest them in that form.

(2) Those consisting of dried milk with the addition of partially malted cereals. These foods therefore contain some starch. *Examples*—Nestle's Food, Mylo Food.

(3) Entirely malted cereals Mellin's Food is the best known. It contains no starch and consists almost entirely of soluble carbohydrates with a very small proportion of proteins.

(4) Partially malted cereals such as Allenbury's Food No. 3, Savory and Moore's Food and Benger's Food. Savory and Moore's Food contains malted diastase, while Benger's Food contains the pancreatic ferment by which the conversion of starch is further carried on when the food is mixed with warm fluid.

(5) Cereal foods in which there has been little or no conversion of starch.

It may be stated as a general rule that no food which contains starch should be used for an infant under seven months of age. Up to nine months only those foods in which the starch has been completely converted into soluble carbohydrates by malting or otherwise should be used for the infant. But the question of starch or no starch is not the only one to be considered. The proportion of fat present in the food as given to the infant is a matter of extreme importance and in this respect most of the patent foods are deficient. The two principal diseases of infancy, rickets and scurvy, are due to deficiencies in proprietary foods. The vitamin deficiency should be covered by using preparations rich in vitamins A, C and D, and this is usually done by giving preparations of cod liver oil and fresh fruit juice for example orange juice. Horlick's and Allenbury's Foods are specially useful where there is great difficulty in digesting the curd of fresh milk so that a feeble infant or one whose digestive powers are impaired by an attack of gastro enteritis may be given one of these foods for a few weeks. Any food containing only completely malted cereals should be used as an addition to milk.

An important fact to be remembered in infant feeding is that the suitability of a particular food for prolonged use cannot be demonstrated by the mere fact that it is taken well and produces no immediate bad results. The evil effects of unsuitable foods may not be clear until the food has been continued for several weeks or months. Indeed in the case of rickets or scurvy the food may not give rise to any obvious digestive disturbances but will ultimately produce these complications.

The Care of Premature Infants

All infants born before full term, that is before the fortieth week of pregnancy, may be considered as premature. The diagnosis of prematurity depends not only on the period of gestation when the child is born but its weight at birth. Children born before the thirty-sixth week of gestation and weighing less than 4½ lbs. are to be treated as premature infants. They require more elaborate

care than children born at term. The most important points to be noted in the management of premature children are —

- (1) The child should be kept warm and in a well ventilated room
- (2) Its skin should be properly protected
- (3) Special care should be taken in feeding the baby, as not infrequently a premature infant is not able to suckle at the mother's breast

To keep the child warm the body should be smeared with olive oil. It should not be bathed for three or four days after birth; it should be wrapped in cotton wool and kept either in an incubator or in a cot well protected and kept warm by hot water bottles under the bed. Particular care should be taken to see that the temperature is uniform and that the hot water bottles are not directly applied to the skin of the infant. When incubators are used the temperature in the incubator should be maintained at a uniform level of about 78° F and there should be efficient ventilation possible within the incubator. In tropical countries an incubator is not necessary for the greater part of the year. It is well to keep the child in a protected cradle and in a room or verandah where sunlight is available. There should be no direct draught upon the child.

Clothing. The infant should be clothed warmly but not so as to impede its free movements or interfere with the process of respiration. No tight fitting clothing about the chest or abdomen should be encouraged. In some cases it is well to wrap the infant in cotton wool, the feet and hands should also be protected by flannel gloves or wrapped in small quantities of cotton wool.

Feeds. A premature baby should be fed at regular intervals and in small quantities. If it can suckle at the mother's breast it is best to encourage it to do so at intervals of two hours. If, however, this is not possible, mother's milk must be drawn off with a breast pump into a sterilised flask or bottle and the infant carefully fed by means of a spoon or pipette.

The child should be disturbed as little as possible, yet frequent change of the napkin is necessary, so that the soiled linen may not be in contact with the tender skin.

Diseases of the New-Born

OPHTHALMIA NEONATORUM

This disease is most commonly due to infection of the eyes with gonococci during the passage of the head of the fœtus through the vagina. Other organisms are occasionally the causative agents

of ophthalmia namely streptococci staphylococci bacilli coli and bacillus diphtheria

Clinical Features About twenty four to forty eight hours after birth there is swelling of the eyelids and a straw coloured watery discharge from the eye the conjunctiva becomes inflamed and later a purulent exudate may be observed the lids stick together and sometimes a considerable amount of pus may collect underneath them The infection usually starts in one eye and if care is not taken to prevent its spread both eyes may be involved and may lead to severe ulceration and permanent loss of vision

Prognosis If treatment is taken in hand early the prognosis is good but in neglected cases the prognosis is very grave in view of the total permanent blindness that may result

Treatment—*Prophylaxis* This has been considered already in connection with the care of the new born Once the actual infection has occurred the treatment should consist of frequent washing of the conjunctival sac with mild boric and the instillation of argyrol 10 per cent or a 1 per cent solution of silver nitrate When one eye is affected it is very important to protect the other by a Buller's shield In severe cases it is better to seek the advice of an ophthalmic specialist

ICTERUS NEONATORUM

A slight amount of jaundice is not infrequent in new born children It appears usually on the third or fourth day after delivery and generally within the first week It is seen first on the trunk and face then on the extremities and conjunctivæ In mild cases the urine and faeces remain normal and the child's health does not suffer in any way The jaundice usually disappears within four or five days or at the most within one or two weeks

This is probably due to the destruction of the red cells with the formation of an excess of bile pigment within the first few days after delivery

There are however other causes of icterus in the new born which do not result in such a mild degree of jaundice and which are often attended with signs and symptoms definitely pathological Among these may be mentioned the varieties of jaundice which are the result of inflammation obstruction severe sepsis and hæmolysis

Catarrhal jaundice is due to some gastro intestinal infection at birth It may be due to the obstruction produced by inflammatory swelling of the mucous membrane of the biliary papillæ The jaundice that results is more severe in form the conjunctivæ tinged yellow the urine is bile stained and the stools are clay coloured

As a result of the enteritis some degree of diarrhœa may be present. It is not attended with any rise of temperature. It generally yields to simple remedies: a teaspoonful of castor-oil or $\frac{1}{4}$ gr of hydrargyrum cum creta will probably clear the jaundice.

Obstructive Type This is generally due to developmental defects in the bile ducts. The resultant jaundice is very severe and the condition is usually fatal.

The **septic type** results in a severe form of jaundice known as *icterus gravis*. It is generally due to septic infection of the umbilical stump. The organisms which gain admission through the stump soon find their way to the liver through the obliterated umbilical vein and give rise to bacteræmia. There is high fever, intense jaundice, clay coloured stools and almost invariably the disease ends fatally.

Familial Icterus Gravis Neonatorum This is a rare variety of jaundice which affects successive members of the same family and begins within a few hours after birth. The child is drowsy and is not able to suckle at the breast. The stools are normal in colour. The urine is dark and contains the bile pigment. It always ends fatally within a few days, the maximum period being three weeks. Cases are on record where recovery has taken place after injection of 15 c.c. of mother's blood into the infant's muscles daily for three or four days.

TETANUS NEONATORUM

This should be a very rare disease but it is still not infrequent in tropical countries where skilled help at birth is not available. It is almost always due to infection of the stump of the umbilical cord by the tetanus bacillus. The signs are those usually present in cases of tetanus in the adult—spasmodic rigidity of the muscles of the jaw, trunk and limbs with difficulty in swallowing.

Prophylactic treatment is the best method of avoiding such a severe complication. Should however infection occur large doses of anti-tetanic serum are indicated intrathecally.

INFANTILE CONVULSIONS

Convulsions in the neonatal period are not infrequent. Convulsions occurring within the first forty-eight hours after delivery are generally due to some damage to the brain which has occurred during the course of delivery. A close scrutiny of the nature of delivery will probably make this clear. They are not infrequent in premature children delivered naturally. They are more common in cases of breech deliveries particularly with premature infants.

Among other causes may be mentioned —

- (1) Asphyxia neonatorum
- (2) Febrile conditions
- (3) Gastro intestinal disturbances
- (4) Developmental errors such as encephalocele hydrocephalus microcephalus, etc

Symptoms Convulsions may occur without any previous warning. They may involve only the face and upper limbs or may be more generalised. In the severe type of convulsions the infant ceases to breathe the face becomes blue and turgid and there is a spasmodic contraction of the muscles. Retraction of the head may occur. Convulsions are generally quite short in duration, they may be repeated again and again in severe cases and may occasionally end in a kind of status epilepticus.

Prognosis depends upon the cause. It is more serious in cases associated with cerebral injury and congenital anomalies.

Treatment Immediate treatment to control the convulsions consists in loosening any clothing about the infant drawing the tongue forward and placing the infant in a hot bath with a cold compress on the head. If breathing has stopped temporarily artificial respiration should be attempted. If the convulsions are frequent a few whiffs of chloroform may be indicated. Bromide and chloral should be administered per rectum to control the fits. It is better to combine the two drugs so as to obtain a more rapid effect. The drugs may also be given by mouth. By the rectum the dose may be about 1 to 2 grs of chloral hydrate and 3 to 5 grs of potassium bromide. By mouth chloral $\frac{1}{2}$ gr with 1 gr of bromide may be given at intervals of three hours.

Perhaps the most satisfactory remedial measure for convulsions consists in the prophylaxis. Care should be taken in the mode of delivery not to cause intracranial stress and so possible injury.

In other cases due to febrile causes the temperature should be kept below 102° and the cause treated. Where convulsions are due to gastro intestinal causes particularly constipation or diarrhoea suitable remedies should be administered. Dietetic precautions are necessary in such cases.

CONGENITAL SYPHILIS

The part played by the mother in transmitting a syphilitic infection to her offspring has been dealt with in detail in the chapter on diseases complicating pregnancy. It has been stated there that an infant may be born manifesting signs of syphilis or it may only some time later show evidence of the infection. The extent to which such manifestations occur depends on (1) the severity of the infection in the mother, (2) the time at which that

infection occurred with reference to gestation, and (3) the efficiency of any treatment that the mother has undergone

Clinical Features A syphilitic infant may show manifestations of the disease at birth. This generally is in the form of an eruption of bullæ or pustules on a dark red base. The skin eruptions may vary in their nature and generally occur within the first three months. They are usually over the naphin area, near the nose and mouth on the palms of the hand and soles of the feet, they may sometimes occur over the whole trunk and the extremities. Condylomata and moist papillæ and ulcerative fissures or rhagades may appear at the angles of the mouth. Simultaneously with the skin eruptions the nails may become opaque and irregular. The hair tends to fall out but in some cases there may be an abundant crop of hair. Syphilitic infants tend to waste and in some cases become marasmic. The wasting is independent of any fault in feeding or irregularity of the bowels, and in infants who waste persistently in the absence of the ordinary causes of marasmus the possibility of congenital syphilis should be considered.

Snuffles is an important and early sign of congenital syphilis that can be easily recognised. It usually occurs within the first six weeks. The condition varies greatly in degree from a slight stuffiness of the nose to a profuse discharge of pus, sometimes blood stained. If the snuffles continue for some time the bridge of the nose may become depressed, the cry may become hoarse and raucous. Suppurative otitis media is often an early manifestation.

When the disease has been present for some time the infant presents a typical picture with marasmus, snuffles, skin eruptions and the other changes consequent thereon. In some cases tertiary lesions develop, they may appear very early or not till the child has grown up. Skin gummata, interstitial orchitis, tertiary lesions of the mouth and throat, interstitial keratitis, affections of the middle ear and changes in the teeth may all appear at a much later period. These manifestations may affect the bones and the viscera and finally the nervous system.

Diagnosis The typical skin eruptions, snuffles, wasting etc., constitute a clinical picture that arrests attention. The diagnosis can be confirmed by the demonstration of the spirochæte pallida in the secretions and by the Wassermann reaction. If the Wassermann reaction of the mother's blood is positive, active treatment of the infant is called for.

Treatment The proper time to undertake treatment with a view either to prevent or abort the attack in the infant is during pregnancy. If however this has not been done or even in cases where treatment has been given during pregnancy but has not been undertaken sufficiently early, it may be necessary to supplement it by antisyphilitic treatment of the new born.

There are certain difficulties in the treatment of congenital syphilis as the same methods that are applicable to adults cannot be applied to children. Arsenical preparations have established their claim in the treatment of syphilis. The question arises whether the infant is to be treated by arsenical injections or by oral administration of iodides and mercury and inunction of mercury. Care has to be taken when injections are given. The ordinary compounds used are novarsenobillon, sulpharsenol, neokharsivan, etc. If injections are to be given it is preferable to give them intramuscularly into the glutei. The dose should not exceed 0.05 gm. if novarsenobillon is used. Sulpharsenol is given either intramuscularly or subcutaneously, the initial dose varying from 1 to 1.5 cgm. With these various methods of treatment by arsenical injections the use of mercury is very usually combined—inunctions are generally used for infants and grey powder and potassium iodide for older children.

If treatment by oral administration and inunction is decided upon, mercury is given in the form of hydrargyrum cum creta by mouth or as mercurial cream; it may be given intramuscularly in doses of $\frac{1}{8}$ to $\frac{1}{2}$ gr. according to age or by inunction. Probably the most convenient and satisfactory method of administration is by inunction. The cream is rubbed into the abdomen, back, either axilla or either groin in turn, the place being changed daily so that there may be no irritation of the skin. This treatment must be continued for months. Bismuth injections are well tolerated and are usually preferable to the use of mercury, the dose being calculated according to age.

Combined with this antisyphilitic treatment hygienic measures should be followed and the child carefully nourished. Occasionally diarrhoea may result when the antisyphilitic treatment will have to be stopped for some time and the usual lines adopted to check the intestinal irritation.

HÆMORRHAGES IN THE NEW BORN

This may occur from a variety of causes. The bleeding may be —

- (1) From the umbilical cord
- (2) From the vagina of a female child
- (3) From the bowels
- (4) Hæmorrhagic manifestations of the skin
- (5) Hæmorrhagic discharge from the nipples

Hæmorrhage from the umbilical cord may occur either primarily or secondarily. Primary hæmorrhage is the result of faulty technique in the ligation of the cord and occurs within an hour after birth. It is to be controlled by applying a second ligature properly.

Secondary hæmorrhage is of more serious consequence. It is generally due to sepsis of the umbilical cord. In some cases the hæmorrhage may occur at the time of the separation of the umbilical cord. Not infrequently jaundice is also present due to the same ætiological factor.

The prognosis is grave. Treatment should aim at controlling the hæmorrhage and dealing with the primary cause. To stop the hæmorrhage the umbilicus should be transfixed by two needles inserted at right angles and a purse string suture put all round and tightened over the umbilical stump. Injections of hemoplastin are desirable and small doses of calcium may be administered in the milk. For the sepsis antistreptococcal serum or the newer remedies for streptococcal infections such as the new derivatives of sulphamamide should be tried.

Hæmorrhage from the vagina. This is of comparative insignificance as generally it occurs in small quantities within the first few days of life. It is possible that this is due to an excess of maternal œstrin circulating in the infant's blood. It generally passes off in a day or two and requires no special treatment.

Hæmorrhage from the bowels *melæna neonatorum*. This is a serious complication and occurs more frequently in children with congenital syphilis. *Melæna* most commonly starts on the second or third day after birth. The motions are usually large and copious brownish black in colour and occasionally may contain bright blood. The infant may also vomit blood. Sometimes convulsions may set in. The infant gradually becomes pale, becomes collapsed and may die.

The prognosis is always grave, recovery may take place if the loss of blood is only through the bowels and in small quantities.

Treatment consists in giving injections of 10 to 20 c.c. of whole blood from the mother into the gluteal region of the infant. It may be repeated once or twice in the day, or small doses of hemoplastin may also be given. All nourishment should be stopped and the infant fed on glucose water. Subcutaneous saline is necessary to revive the child.

Hæmorrhages in the skin. Occasionally purpuric rashes may appear in the skin. These may be due to severe septic infection or to a hæmorrhagic diathesis. The disease always ends fatally.

Hæmorrhagic discharge from the breast. Occasionally slightly blood stained fluid may be expressed from one or other of the nipples. It is not generally of any clinical significance. It is best to clean the nipples and where there is engorgement or inflammation to apply hot compresses three or four times a day for a few days. Calcium lactate in small doses of 1 to 2 grs. may be given in milk three or four times a day. The general nutrition of the infant should be carefully looked after.

SECTION V
PATHOLOGY OF PREGNANCY

CHAPTER XVI
TOXÆMIAS OF PREGNANCY

UNDER this heading are grouped a number of diseases which not infrequently occur during the course of pregnancy, wherein certain toxins or poisons are supposed to be present in the blood stream causing pathological changes in various organs. The exact nature of the toxins and the mode of their origin are still shrouded in mystery, and numerous and varied are the theories that have been advanced to explain these toxæmias. We shall refer to these theories when dealing with eclampsia, but we may state here that although in a perfectly healthy woman the different organs should adjust themselves to the increasing needs of the foetus *in utero*, the metabolic processes may easily become altered so that the system fails to adjust itself to the varying needs of the growing ovum and the mother. Certain predisposing factors may lead to the onset of pathological changes which once they appear, may progress unless they are diagnosed early and suitable measures instituted. It is for this reason that considerable emphasis has been laid upon the hygiene of pregnancy, and it may be laid down as a general rule that careful attention to the hygiene of pregnancy does in the large majority of cases prevent the possible onset of toxæmia.

Varieties The milder forms of toxæmia may be but an exaggeration of some of the symptoms of pregnancy, such as nausea, vomiting etc. In other cases they may show themselves as the minor complaints of pregnancy and affect various systems, such as the digestive, circulatory, respiratory, urinary systems and the skin. Among the minor complaints may be mentioned pruritis, urticaria, palpitation, varicose veins, enlarged thyroid, mild degrees of anæmia, etc.

The more severe forms of toxæmia of pregnancy may be classified under the following headings —

- (1) Hyperemesis gravidarum
- (2) Acute yellow atrophy of the liver
- (3) Pre eclamptic toxæmia or pregnancy kidney
- (4) Eclampsia
- (5) Concealed accidental hæmorrhage

HYPEREMESIS GRAVIDARUM

Nausea and vomiting are symptoms that occur in the majority of pregnant women during the early weeks of pregnancy. Ordinarily they begin about the sixth week and gradually subside after the twelfth week. In some cases they may persist for a longer period, up to the sixteenth or twentieth week, but are not associated with any serious signs or symptoms and the general health of the patient is not seriously impaired. Very rarely this may continue throughout the course of pregnancy, the patient vomiting once or twice in the morning, but later in the day feeling comfortable enough to retain nourishment, thus keeping up her strength.

Hyperemesis, on the other hand, is the condition where the vomiting becomes obstinate and uncontrollable and occurs much more frequently, sometimes lasting throughout the day, so that the patient is hardly able to retain anything, and eventually the general health of the patient suffers and signs of wasting and dehydration appear.

Ætiology The ætiology of this particular form of toxæmia also is not clear. There are certain conditions which may favour the occurrence of hyperemesis, and on this basis two types are recognised —

- (1) Neurotic, and
- (2) Toxic

The *neurotic* type of hyperemesis is more common among women of an emotional temperament and is accentuated by domestic or other worries. In some cases there may be a reflex factor involved such as retroversion of the gravid uterus, erosion of the cervix, pelvic inflammations, hydatidiform mole.

In the *toxic* form, which occurs in the majority of cases of hyperemesis of the severer degree, changes take place in the liver, kidneys, stomach and blood. These cannot be all explained on the basis of want of nourishment and dehydration. What the particular nature of the toxin is and where it is formed are subjects still open for discussion. It is possible that abnormal function of one or other of the endocrine glands may be responsible in some cases. On the other hand, the theory has been advanced that the toxæmia is of intestinal origin, and these toxins circulating in the blood cause the pathological changes in the organs already enumerated. Why toxæmia should produce vomiting in some cases and lead to other manifestations in others is a matter still under discussion.

In the majority of cases of the neurotic type, consequent upon vomiting, changes are produced which by themselves may lead on to the toxic variety. The lack of nourishment and the consequent dehydration may result in changes in the liver due to the glycogen store being depleted, resulting in necrosis and fatty degeneration.

and probably jaundice. The impaired function of the liver results in deficient detoxication and a vicious circle is thus produced which leads to further changes in the kidneys stomach liver and even the intestines.

Deficient carbohydrate metabolism may result in imperfect combustion of fats leading to acidosis which in itself may cause increase in vomiting.

Lastly, it must be borne in mind that there are other conditions which may cause vomiting in the pregnant woman just as they would in the non gravid such as gastric ulceration carcinoma appendicitis uræmia etc.

In the severe cases which end fatally lesions are usually found in the liver and kidneys. Central necrosis of the lobules of the liver and degenerative changes in the convoluted tubules of the kidney may be present. The glomeruli are generally little affected. The heart undergoes fatty degeneration.

Signs and Symptoms The chief symptom is the increased vomiting associated with a constant feeling of nausea. Anorexia supervenes and gradually the character of the vomit changes so that not only undigested food but mucus with streaks of blood and tinged with bile may be present. After a time the patient gradually becomes emaciated the skin is dry inelastic and wrinkled the eyes are sunken the tongue becomes dry cracked and there may be a fetid odour in the breath. The patient is restless irritable the pulse increased in frequency the blood pressure is low and in the later stages jaundice may develop and the breath may smell of acetone. The patient gradually sinks becomes unconscious develops a low muttering delirium with a slight increase in temperature and ultimately she passes into coma and death supervenes. The urine may be markedly diminished in quantity and albumin with renal casts may be present. When the emaciation is more pronounced acetone and diacetic acid may be present and occasionally bile. In some cases of a more acute nature where the vomiting is very severe associated with a great deal of retching the vomit may be of a coffee ground colour. Retching may be the most important symptom and little or no vomit may occur except slight blood stained mucoid material.

Diagnosis Two factors have to be first determined in the diagnosis of this condition —

- (1) The existence of pregnancy
- (2) The absence of any other condition which may cause vomiting

The diagnosis of pregnancy depends upon the presumptive signs and symptoms at this stage such as amenorrhœa changes in

the breasts softening of the cervix, Hegar's sign and as none of these have a positive value, the diagnosis can only be clinched by performing the Aschheim Zondek or Friedman's tests

The conditions which may cause vomiting apart from pregnancy must be borne in mind, and a careful investigation made with a view to exclude such causes

Attempts have been made to determine the particular type of vomiting whether it is toxic or neurotic, and also to estimate the seriousness of the condition by various laboratory tests Estimation of the ammonia coefficient, of the blood chloride as well as of its uric acid content has been made but so far no definite conclusive findings have been reached which can aid in the diagnosis or prognosis of the condition It may, however, be said that a case should be presumed to be of the severe type, if in spite of treatment the vomiting persists and the patient's condition steadily deteriorates she loses weight, the pulse rate increases in rapidity, fever sets in the vomiting becomes coffee ground, jaundice appears and coma or delirium occurs A fall in blood pressure and the appearance of bile in the urine are unfavourable signs

Prognosis In the majority of cases the hyperemesis is of the neurotic type and if taken in hand early and treated with care the prognosis is good

In the toxic variety the prognosis is less favourable, and if there has been delay in the interruption of pregnancy till the woman has become very emaciated and semi-conscious, the prognosis is definitely grave

Favourable factors in prognosis are —

(1) Cessation of vomiting This, by itself, is not a sign that the woman is actually out of danger, but must be taken along with the general improvement of the patient that must necessarily occur

(2) Increase in the quantity of urine This is evidence that the patient is able to retain fluids and that the circulation through the kidneys is effective and the damage is not serious

(3) A slow pulse of good volume and regularity

(4) A clean moist tongue, which proves that the intestinal tract is functioning properly

(5) Absence of jaundice This does not mean that the patient is entirely free from danger, although its presence is definitely of bad prognostic significance

(6) A normal blood pressure A fall in blood pressure is evidence of cardiac failure due to toxic myocarditis

(7) Normal temperature This may not carry much significance, as in some cases the temperature may not rise However, an elevated temperature or a subnormal one is indicative of a bad prognosis

(8) Absence of bile and albumin in the urine While albumin may not necessarily appear in cases of hyperemesis its presence in the urine is a bad sign and so is the presence of bile

(9) No hæmorrhagic retinitis The absence of this sign may be of no significance but its presence is definitely indicative of a serious state of affairs which may necessitate the termination of pregnancy

Treatment In the treatment of this condition the following points should be borne in mind —

(1) Isolation of the patient preferably in an institution or at least away from familiar surroundings and from personal contact with immediate relatives

(2) Correction of the associated disturbances or lesions

(3) Dietetic measures

(a) An adequate supply of diet with a high carbohydrate content and easily assimilable

(b) Diminution to the irreducible minimum of the intake of proteins

(c) The avoidance of all fatty foodstuffs so as to reduce the chances of acidosis

(4) An increase in the quantity of fluid taken by the patient in between meals so as to produce a free diuresis and supply fluid for the dehydrated condition of the tissues

(5) To keep the bowels fairly free so as to minimise the chances of toxic absorption from the intestines

(6) Sedatives so as to reduce the irritability of the stomach and of the nervous system

For purposes of treatment cases of hyperemesis gravidarum may be considered under three groups—mild moderate and severe

In the *mild cases* there is an exaggeration of the symptom of morning sickness and often these patients require nothing more than to be given a definite plan to follow in regard to intake of foods and avoidance of rich protein and fatty foodstuffs with attention to bowels and to any reflex factors responsible such as erosion of the cervix displacements of the uterus etc It is well to assure the patient that the condition is amenable to treatment and it is here more than anywhere else that the psychic factor plays its part and the confidence that the physician is able to inspire is largely responsible for the cure of the condition Occasionally brilliant results are reported through the administration of certain drugs but in the majority of cases the undoubted factor in the cure of the condition is the underlying psychic factor

Moderate Cases In these cases the patient suffers from the effects of the hyperemesis and may show signs of dehydration and starvation and of changes in the liver The urine may be

the breasts softening of the cervix Hegar's sign and as none of these have a positive value the diagnosis can only be clinched by performing the Aschheim Zondek or Friedman's tests

The conditions which may cause vomiting apart from pregnancy must be borne in mind and a careful investigation made with a view to exclude such causes

Attempts have been made to determine the particular type of vomiting whether it is toxic or neurotic and also to estimate the seriousness of the condition by various laboratory tests Estimation of the ammonia coefficient of the blood chloride as well as of its uric acid content has been made but so far no definite conclusive findings have been reached which can aid in the diagnosis or prognosis of the condition. It may however be said that a case should be presumed to be of the severe type if in spite of treatment the vomiting persists and the patient's condition steadily deteriorates she loses weight the pulse rate increases in rapidity fever sets in the vomiting becomes coffee ground jaundice appears and coma or delirium occurs A fall in blood pressure and the appearance of bile in the urine are unfavourable signs

Prognosis In the majority of cases the hyperemesis is of the neurotic type and if taken in hand early and treated with care the prognosis is good

In the toxæmic variety the prognosis is less favourable and if there has been delay in the interruption of pregnancy till the woman has become very emaciated and semi-conscious the prognosis is definitely grave

Favourable factors in prognosis are —

(1) Cessation of vomiting This by itself is not a sign that the woman is actually out of danger but must be taken along with the general improvement of the patient that must necessarily occur

(2) Increase in the quantity of urine This is evidence that the patient is able to retain fluids and that the circulation through the kidneys is effective and the damage is not serious

(3) A slow pulse of good volume and regularity

(4) A clean moist tongue which proves that the intestinal tract is functioning properly

(5) Absence of jaundice This does not mean that the patient is entirely free from danger although its presence is definitely of bad prognostic significance

(6) A normal blood pressure A fall in blood pressure is evidence of cardiac failure due to toxic myocarditis

(7) Normal temperature This may not carry much significance as in some cases the temperature may not rise However an elevated temperature or a subnormal one is indicative of a bad prognosis

(8) Absence of bile and albumin in the urine While albumin may not necessarily appear in cases of hyperemesis its presence in the urine is a bad sign and so is the presence of bile

(9) No hæmorrhagic retinitis The absence of this sign may be of no significance but its presence is definitely indicative of a serious state of affairs which may necessitate the termination of pregnancy

Treatment In the treatment of this condition the following points should be borne in mind —

(1) Isolation of the patient preferably in an institution or at least away from familiar surroundings and from personal contact with immediate relatives

(2) Correction of the associated disturbances or lesions

(3) *Dietetic measures*

(a) An adequate supply of diet with a high carbohydrate content and easily assimilable

(b) Diminution to the irreducible minimum of the intake of proteins

(c) The avoidance of all fatty foodstuffs so as to reduce the chances of acidosis

(4) An increase in the quantity of fluid taken by the patient in between meals so as to produce a free diuresis and supply fluid for the dehydrated condition of the tissues

(5) To keep the bowels fairly free so as to minimise the chances of toxic absorption from the intestines

(6) Sedatives so as to reduce the irritability of the stomach and of the nervous system

For purposes of treatment cases of hyperemesis gravidarum may be considered under three groups—mild moderate and severe

In the *mild cases* there is an exaggeration of the symptom of morning sickness and often these patients require nothing more than to be given a definite plan to follow in regard to intake of foods and avoidance of rich protein and fatty foodstuffs with attention to bowels and to any reflex factors responsible such as erosion of the cervix displacements of the uterus etc It is well to assure the patient that the condition is amenable to treatment and it is here more than anywhere else that the *psychic factor* plays its part and the confidence that the physician is able to inspire is largely responsible for the cure of the condition Occasionally brilliant results are reported through the administration of certain drugs but in the majority of cases the undoubted factor in the cure of the condition is the underlying *psychic factor*

Moderate Cases In these cases the patient suffers from the effects of the hyperemesis and may show signs of dehydration and starvation and of changes in the liver The urine may be

diminished in quantity and may contain acetone. In such cases it is best to isolate them preferably in a hospital. Complete rest in bed is essential. As far as possible all nourishment should be given per rectum. The bowels should be attended to every morning by giving a large soap and water enema or a bowel wash followed by nutrient enemata at intervals during the day. Drinks of fruit juice sips of water or glucose and water should be given at intervals of three hours and in small quantities only at a time. It is well however to avoid all nourishment by mouth for a day or two. Sedatives are indicated. Bromides may be given per rectum. 30 grains of potassium bromide or 10 grains each of the triple bromides potassium sodium and ammonium may be added to the nutrient enema given at bedtime.

If in spite of this the patient fails to improve or becomes worse more radical methods of treatment to be outlined later may have to be adopted. Particular care should be taken to watch for any of the signs and symptoms suggestive of an aggravation of this condition such as jaundice albuminuria serious diminution in the quantity of urine etc. and if such signs manifest themselves the need for termination of pregnancy must be considered.

Of the many drugs that have been used in the treatment of this condition may be mentioned cerium oxalate which is given in doses of 3 to 5 grains four to six times a day corpus luteum extract given by injection thyroid Lugol's iodine bismuth, dilute hydrocyanic acid cocaine etc. Preparations of calcium have been used with benefit in some cases. Calcium gluconate 5 c.c. of a 10 per cent solution can be given daily intramuscularly for a few days.

In some cases where erosion of the cervix is present coagulation of the cervix by touching it up once or twice a day with a 5 to 10 per cent solution of cocaine is occasionally beneficial.

The replacement of a displaced gravid uterus has already been referred to as a factor in the treatment of some cases.

Severe Cases. The majority of cases generally improve on the above lines of treatment. When however such treatment fails and the disease takes a severe turn the condition of the patient rapidly becomes worse. The symptoms of a severe type of hyperemesis are the vomiting is extremely severe and lasts the whole day sometimes becoming coffee ground jaundice may supervene the pulse becomes rapid the skin dry eyes sunken abdomen scaphoid patient is irritable complains of thirst the urine is very much diminished and may contain albumin acetone bodies and casts.

When the diagnosis of a severe type of hyperemesis is made the patient should be isolated preferably in a hospital so that there may be the fullest control over her and her environment.

A definite plan of treatment should be adopted carefully watching the progress from day to day. Careful nursing by a nurse who understands the general principles involved and keeps a firm and efficient control over the patient at the same time gaining her confidence will go a great way towards improving the condition of the patient.

The associated factors such as cervicitis or a retroversion should be attended to. The bowels should be thoroughly cleansed by means of large enemata and for the first twenty four to forty eight hours all nourishment by mouth should be stopped. The mouth and teeth should be kept clean. To combat dehydration it is necessary to give fluids by other methods. Proctoclysis or saline per rectum must claim our first attention. In the more severe cases however it may be necessary to give an immediate injection of glucose by the intravenous method or in some cases saline can be given subcutaneously. About a litre of 5 per cent glucose in saline may be given at a time by the intravenous route. It is preferable to combine these methods with proctoclysis. Sedatives should be administered to give rest and favour sleep. Bromides 90 to 120 grains may be dissolved in 1000 c.c. of fluid and given per rectum. Occasionally chloral hydrate may be substituted for the bromides and in some cases either tincture opii or liquor morphine hydrochloride can similarly be given.

Amongst the drugs that are sometimes given by injection besides the glucose solution already referred to are calcium gluconate 10 c.c. of a 5 per cent solution. The use of insulin has been advocated on the ground that the acidosis in severe cases of vomiting is due to deficient utilisation of carbohydrates and that insulin as in cases of diabetes will help in carbohydrate metabolism and thus prevent acidosis. It is advised that insulin should be covered by the administration of dextrose in the proportion of 10 grams of dextrose for each unit of insulin.

In spite of this treatment improvement may not occur and the patient progressively becomes worse on account of the dehydration and starvation. If therefore in spite of intensive treatment vomiting persists evidence of dehydration and starvation is present the skin is dry and pulse rate remains high or if temperature rises or jaundice intervenes interruption of pregnancy must be considered.

The indications for terminating pregnancy in cases of hyperemesis gravidarum are —

(1) If no improvement occurs after careful treatment on the lines suggested and the patient becomes gradually weaker after such treatment is carried out for a week or ten days.

(2) If the pulse is constantly high above 120 or the temperature rises above 100° F.

(3) Serious diminution in the quantity of urine excreted or persistent albuminuria

(4) The occurrence of jaundice or the presence of bile in the urine

(5) Persistently low blood pressure

(6) Retinal changes particularly albuminuric or hemorrhagic retinitis

One important point to bear in mind is that therapeutic abortion should never be delayed till the patient has become so intensely toxæmic that no response to treatment after interruption is possible. The stage of low muttering delirium and coma must never be allowed to occur before termination is decided upon.

Considerable judgment is necessary to determine the optimum time for such interruption of pregnancy but on the whole it is safer to terminate it too early rather than to wait in the vain hope that the patient may ultimately recover.

The method employed to empty the uterus must ensure a minimum amount of shock to the patient and reduce to the smallest proportions the risk of sepsis. When operation is indicated the vitality of the patient is so low that she is very liable to infection. Any method which produces a severe strain by prolonging the period required for the emptying of the uterus also adds to the risk. It may however be mentioned that even though the uterus may not be completely emptied if the ovum dies *in utero* relief in the symptoms is almost immediately noticeable.

In the first trimester of pregnancy there are two methods available. It is possible to dilate the cervix and evacuate the uterus by curettage with the finger or the blunt curette. This may be done either at one or two stages. We personally prefer to dilate the cervix and stir up the contents of the uterus thereafter leaving the case alone only giving a small dose of pituitary extract if necessary. Twenty four hours later the woman may abort spontaneously or the cervix may be sufficiently dilated to permit of easy removal of the dead ovum. An alternative method of evacuation at this stage is hysterotomy either by the vaginal or the abdominal route.

After the twelfth week the products of conception attain a size which renders it increasingly difficult for thorough evacuation through the cervical route by ordinary methods of dilatation. Under such circumstances it is safer to employ abdominal or vaginal hysterotomy. The former can be done under local anaesthesia and is attended with less shock and no chance of sepsis.

After evacuation by any of these methods the patient should be given glucose and saline per rectum and a stimulant line of treatment adopted.

The question has been raised whether in subsequent pregnancies

the hyperemesis may not recur and if because of this possibility it is desirable to consider the advisability of sterilisation. There are a few cases where with each pregnancy the woman may suffer from a more or less severe type of hyperemesis but we are convinced that in the large majority of cases it does not recur and therefore sterilisation is not justified.

ACUTE YELLOW ATROPHY OF THE LIVER

This is a very rare and fatal complication in which jaundice diminution in the size of the liver fever and nervous symptoms are caused by necrosis of the liver cells. Pregnancy is one of the chief exciting causes but the disease may also occur in the non-gravid from conditions which cause an acute toxic and infective hepatitis for instance alcohol chloroform and phosphorus poisoning secondary syphilis typhoid fever and influenza. It may occur during any period of pregnancy during labour or in the puerperium.

Pathology The condition is caused by a very acute necrosis of the liver cells the intercellular ferments of which are set free and produce autolysis. If the disease ends fatally within two or three days the liver may be found enlarged and yellow but if death occurs after a week the liver shrinks to a half or third of the normal size. The surface is smooth and the capsule loose and wrinkled. Hemorrhages may sometimes be found under the capsule associated changes may be found in some of the other organs such as the heart the muscles and the glands of the digestive tract which may be undergoing fatty degeneration. The kidneys undergo severe changes particularly involving the convoluted tubules which may be found degenerated. The spleen may be enlarged and soft.

Symptoms In the *first stage* jaundice is present with fever malaise and vomiting. This stage may in some cases last for five or six days.

In the *second stage* of the disease when the liver fails to function drowsiness headache photophobia restlessness and delirium with characteristic maniacal shrieking may be present. Muscular twitchings and occasionally convulsions may follow and the patient becomes violent. The pupils may be dilated there may be an extensor plantar reflex. Retraction of the head may be present suggesting meningitis. The vomiting may be severe the tongue is dry and tremulous the pulse becomes rapid and feeble the temperature is subnormal hemorrhages may occur from the gums nose kidneys alimentary canal and uterus. Coma finally develops with Cheyne Stokes breathing and the patient may eventually die after the disease has lasted in this stage for

three to four days. In the first stage the liver is often enlarged and tender but later it rapidly shrinks and in some cases hepatic dullness may not be elicited at all the intestines getting in between the shrunken and flabby liver and the abdominal wall. A moderate leucocytosis may be present. The urine is diminished, high coloured, contains albumin, casts, bile and blood. Pounded discs of leucin and needle shaped crystals of tyrosine derived from autolysis of the liver cells may be found in the urine. Leucin and tyrosine however may be found in other conditions such as typhoid fever, erysipelas and leukaemia so that their presence is not pathognomonic of acute yellow atrophy.

Diagnosis The diagnosis of this condition depends upon —

- (1) The severe general symptoms
- (2) Diminution of liver dullness
- (3) Jaundice—which should always arouse suspicion in a pregnant woman

An examination of the urine may also be of help.

Prognosis Is very bad the child always dies *in utero*. Occasionally a case is reported as having survived but such reports have always been challenged on grounds of mistaken diagnosis.

Treatment It is obvious that very little can be done by way of treatment in such a rapidly fatal disease. Treatment is largely symptomatic. In the early stages of the disease the diet should consist of carbohydrates only and large quantities of fluids. If there is much vomiting salines per rectum and subcutaneously should be given. Large quantities of sodium bicarbonate may be required to counteract the acid intoxication. Intravenous injections of 10 to 20 per cent dextrose solution with small doses of insulin as in cases of hyperemesis have been tried.

The question of termination of pregnancy should be considered whenever the diagnosis has been made unless the patient is so ill that interference might precipitate the end. Vaginal or abdominal hysterotomy should be the operation of choice under local anaesthesia.

PRE ECLAMPTIC TOXAEMIA

By this term is meant the condition which sometimes occurs in pregnant women characterised by certain signs and symptoms which if not properly treated may eventually lead to the complication known as *eclampsia*. The term *albuminuria of pregnancy* is also applied to this condition but inasmuch as albuminuria may occur in other conditions and need not necessarily be one of the signs of pre-eclamptic toxæmia it is more desirable to use the term *pre-eclamptic toxæmia* for the symptom complex which generally precedes the onset of true *eclampsia*.

The term *pre eclampsia* is sometimes used to denote the condition which is the immediate precursor of eclampsia and which will almost inevitably end in the occurrence of eclampsia unless adequately treated. It can therefore be said to be an extreme degree of pre eclamptic toxæmia and is fortunately not so frequent except in neglected cases.

Another term commonly used in relation to this particular type of toxæmia is *eclampsism*. In this condition the signs and symptoms of pre eclampsia are manifest but the patient goes into a condition of coma without actual convulsions developing.

Pre eclamptic toxæmia is more frequent in primigravidae than in those who have borne several children and usually develops during the last trimester of pregnancy. Occasionally however it has been known to occur even as early as the twentieth week of pregnancy.

Signs and Symptoms The onset of symptoms of pre eclamptic toxæmia is usually insidious. Generally it gives rise to definite signs and symptoms which either in combination or as individual signs or symptoms must always arrest the attention of the obstetrician to the possibility of the condition being present.

The chief signs and symptoms of pre eclamptic toxæmia are —

(1) *A Rise in Blood Pressure* Ordinarily the blood pressure is between 110 and 120 mm of mercury. If it is above 130 it must always arouse suspicion and blood pressure readings above 150 mm are definitely suggestive of toxæmia. The blood pressure may exist in association with other signs to be described later or occasionally it may be the only sign and is usually the earliest. The importance of taking blood pressure readings therefore in all pregnant women after the twenty fourth week cannot be over emphasised.

(2) *Albuminuria* In association with a rise in blood pressure or occasionally without any marked rise albuminuria may occur. Albuminuria may be very slight or may be so marked that the urine solidifies on boiling. Albuminuria need not however be present in all cases and even in some of those cases which later develop eclampsia the absence of albumin has been noticed. In the majority of cases however albuminuria is a fairly constant sign. In association with albuminuria there may be a diminution in the quantity of urine passed. The amount of albumin in the urine is generally a measure of the severity of the toxæmia. In addition to albumin there may be casts hyaline epithelial and granular. red cells and pus cells may also be present in the urine.

(3) *Edema* Edema of varying degree and extent is fairly constant in pre eclamptic toxæmia. It first occurs in the lower extremities and may be more evident in the evening disappearing after rest. Edema is significant if it is bilateral occasionally

unilateral œdema may occur in the later weeks of pregnancy due to relatively increased pressure of the presenting part on one side of the pelvis. When œdema is more generalised it involves the hands arms face the labia and lower abdomen.

œdema may however, occur in various other conditions such as the more severe degrees of anæmia and in some cases of hypovitaminosis and cardiac complications.

(4) *Increase in Weight* It is now definitely realised that an excessive gain in weight is the earliest indication of pre-eclamptic toxæmia. It is due to the retention of fluid in the tissues. A rapid increase in the weight of a pregnant woman especially during the third trimester is an important indication of pre-eclamptic toxæmia even in the absence of hypertension or albuminuria or visible œdema.

Because of this it would appear that it is a wise precaution to weigh every pregnant woman at intervals of a week or at least a fortnight in the last sixteen weeks of pregnancy. A gain in weight of more than 5 lbs. in any month or a total gain of over 20 lbs. should suggest the possibility of toxæmia setting in.

These signs are associated in the more severe forms of the disease with definite symptoms prominent among which are headache dizziness dimness of vision photophobia epigastric pain nausea and vomiting.

The symptoms may gradually or sometimes more rapidly increase in severity and if left untreated result in the onset of eclampsia. It should not be presumed that all the signs or even the majority of them should necessarily be present. In some cases perhaps one or two of the signs and symptoms appear but the patient is not aware of their existence before actual convulsions set in. Hence the necessity of periodic examination of the pregnant mother at an antenatal clinic whether she complains of any symptoms or not.

The chief things to note are the blood pressure the presence of albumin in the urine and œdema. Among the symptoms a careful watch must be kept over headache disturbances of vision epigastric pain and a sense of constriction round the chest.

Prognosis If recognised early and treated promptly the majority of the cases end satisfactorily. In some however it must be confessed that no matter what method of treatment is used eclampsia develops. In others again the only possibility of saving the woman is the termination of pregnancy irrespective of the period of gestation. The prognosis must be considered both from the immediate and remote points of view. The immediate outlook is in the majority of cases favourable. The remote or ultimate prognosis depends upon the duration of the signs and symptoms before there is response to treatment. It is now well recognised

that if hypertension or albuminuria be allowed to continue for a long period *eg* over ten days the possibility is that permanent damage to the kidney may result the extent of the damage being in proportion to the length of such a period. The damage to the kidney may show itself only at a subsequent pregnancy. The term occult nephritis is applied to this condition.

The prognosis for the foetus is unfavourable. In the majority of cases premature labour may set in or if the toxæmia is pronounced or persistent the foetus may die *in utero*. In others again the treatment by induction of premature labour is unfavourable to the foetus. The prognosis also depends upon the severity of the toxæmia.

Treatment—Prophylactic If efficient prenatal care is taken the condition yields to treatment generally provided the diagnosis has been made at an early date. Every pregnant woman should therefore be thoroughly examined from as early a stage of pregnancy as possible—certainly from the sixteenth week onward. Any foci of septic infection as in the teeth or tonsils should be promptly attended to. At each examination which must be at fairly frequent intervals certainly not longer than a fortnight before the thirty second week and at weekly intervals subsequent to that the blood pressure and weight should be recorded and the urine examined for the presence of albumin. If œdema is noted the patient should be searchingly questioned as to the presence of other possible symptoms and should be warned that if any of such symptoms should develop she must immediately report herself at the ante natal centre or consult an obstetrician.

Care must be taken in regulating the diet of pregnant women so that it consists largely of fruit and vegetables with carbohydrates while fats and proteins are reduced to the minimum. Rich spicy foods should generally be avoided. The gain in weight should be noted and as has been stated already it is unfavourable if over 20 lbs. The total quantity of urine passed in the day should generally be noted. A mild form of exercise is beneficial and a warm or tepid bath is invaluable. Care must be taken to see that the bowels are well regulated laxatives may have to be given. It is advisable to give the patient a dose of castor oil ($\frac{1}{2}$ oz) at intervals of a fortnight. If œdema is present the quantity of fluids taken should be limited. The diet should be such as will contain an adequate supply of vitamins and this is generally obtained by taking milk vegetables fruit etc. The intake of salt should be reduced to a minimum and it is inadvisable to take any tea coffee or alcoholic drinks.

Curative Treatment If in spite of this regimen the symptoms do not abate and the signs gradually increase it is better that the patient be put to bed preferably in an institution. The blood

pressure should be systematically recorded every four hours the total quantity of urine passed in twenty four hours estimated, and the albumin content noted from day to day. Biochemical investigations of the blood are helpful in determining whether there is increased retention of non protein nitrogen or urea and for the estimation of chlorides if oedema is present. It is also desirable to examine the retina for signs of albuminuric retinitis.

When the pre eclamptic toxæmia is of moderate severity the diet should be strictly limited. A milk diet is desirable and the total quantity of milk allowed daily should be limited to two to three pints. In the very severe type of case starvation is the better method of treatment at least for forty eight hours the patient being given occasional drinks of glucose barley water mineral waters and fruit juice the quantity of intake of fluids being restricted to an amount less than the quantity of urine secreted.

The bowels should be kept free by saline purgatives. Sedatives are of use in promoting sleep and relieving restlessness bromides in doses of 60 grains by mouth or 100 to 150 grains per rectum daily in association with chloral hydrate 20 to 30 grains. It is not desirable to keep a woman on a strict diet over any prolonged period as the patient may be unduly weakened and other complications may set in.

In some of the more severe types of pre-eclamptic toxæmia intravenous injections of 20 c.c. of a 10 per cent solution of magnesium sulphate or 10 to 15 c.c. of a 25 per cent solution intramuscularly, have been used with good results. It is preferable to adopt the intramuscular route as the intravenous method of administration has produced alarming symptoms in some cases.

Intravenous injections of 10 to 20 per cent solutions of glucose have also been used in certain cases. If from the irritability of the nervous system oedema of the brain is suspected intravenous injection of 20 to 25 per cent solution of glucose has sometimes been used. The effect of using glucose or calcium gluconate is to produce prompt diuresis with diminution of oedema a reduction in weight and in blood pressure.

If in spite of all these measures the signs and symptoms do not abate one must inevitably face the question of terminating pregnancy. If the systolic blood pressure remains above 160 mm. if retinal signs manifest themselves if persistent headache visual disturbances and epigastric pain are present and if associated with these there be restlessness sleeplessness mental and muscular irritability it is obvious that the patient is likely at any time to develop the more serious condition of eclampsia. It is not desirable to wait till it sets in and we prefer in the majority of cases where treatment does not show definite improvement within a period of ten to fifteen days to terminate pregnancy.

The question of foetal mortality and the possibilities of survival of the foetus have necessarily to be borne in mind. It is true if the pregnancy is terminated much earlier than the thirty fourth week the chances are very poor of the foetus surviving. At the same time it must be clearly realised that the chances of its survival are equally poor if pregnancy be not terminated and the toxæmia is allowed to continue with the additional risk to the mother. It would therefore appear to be safer not to risk the lives of both mother and foetus in a vain attempt to save the child but to terminate pregnancy when inevitable for the sake of the mother.

The method of termination of pregnancy is a matter of some importance. Any method of forced delivery is to be deprecated and the greatest care should be taken to ensure asepsis. Apart from the shock involved in rapid methods of delivery the chances of infection are greater in a woman subjected to toxæmia and one must therefore be punctilious in choosing the method of termination and in the technique thereof.

Medicinal methods of induction of labour are not always successful if adopted earlier than the thirty sixth week. Even at a later stage they have to be repeated and in the more severe forms of toxæmia there may not be enough time to repeat such methods of induction.

A method of induction of labour which can be adopted in these cases with safety is puncture of the membranes low down. We have for some time invariably adopted this method with uniformly good results. Labour starts within twelve to twenty four hours and the actual duration of labour would appear to be shorter than in cases where the membranes rupture in the ordinary course of labour. Another point that has been noted is that in cases where the membranes are ruptured high up the duration of labour is longer than in cases where they are ruptured at the most dependent part.

Another method that may sometimes be adopted is the time honoured method of separating the membranes from the uterine wall by the passage of two or three gum elastic bougies (Krause's method). Strict aseptic precautions must be taken and generally labour sets in within twelve to twenty four hours after the insertion of the bougies.

In recent years owing to the uncertainties and the delay in the onset of labour by any of the methods suggested above there is a growing tendency to resort to Cæsarean section for the termination of pregnancy in severe cases of pre eclamptic toxæmia. Cæsarean section may be done either by the abdominal or vaginal route. The majority of obstetricians would perhaps prefer the abdominal route but in some selected cases as in multiparæ with a history of previous normal labours or with a premature foetus the vaginal route may be found suitable.

Termination of pregnancy is indicated for two reasons—to prevent the possible onset of eclampsia and to prevent the possible development of occult nephritis at a later date. Where termination of pregnancy is adopted as a method of treatment it is desirable to emphasise that this should not be delayed till a late stage, as under such circumstances it may sometimes not be possible to prevent the onset of eclampsia, and in the more chronic and severe forms the mischief may have already occurred and permanent damage to the kidney be inevitable.

After delivery the symptoms and signs rapidly abate, but in some cases high blood pressure or albuminuria may persist and may lead to the onset of postpartum eclampsia unless carefully treated. The longer the pre-eclamptic toxæmia has been allowed to persist the greater are the chances of permanent damage to the kidney and the more slowly will the signs and symptoms abate.

Dietetic precautions, regulation of bowels favouring the free secretion of urine and mental and physical rest are essential during the puerperium.

ECLAMPSIA

This is a convulsive disease occurring in pregnant parturient or puerperal women usually characterised by a high blood pressure, marked albuminuria, œdema and such symptoms as headache, dizziness, disturbances of vision, epigastric pain, convulsions and coma, and which sometimes ends in death.

Incidence. It is more common among primipare than among multipare. Over 75 per cent. of the cases occur in primipare. The striking fact about the disease is that it occurs more commonly in certain areas than in others and what is even more significant, the severity of the disease is much greater in certain centres than in others. It has been suggested that eclampsia occurs more frequently when the humidity is greater and particularly during the winter and rainy seasons, but a careful investigation into its incidence in relation to atmospheric conditions over a number of years has not revealed any definite increase in the particularly humid months of the year or when the rainfall was much greater. It has been noted, however, that after rains following a dry and hot weather the incidence of albuminuria and eclampsia has been greater.

The severity of the disease, however, varies in different localities. Occasionally one may have a long series of cases of a mild type to be followed by an extremely severe type of the disease in the next few cases, so that all statistics relating to the efficacy of any particular method of treatment are completely vitiated unless a large number of cases are taken into consideration.

Causation. Eclampsia has been known as a disease of theories, and this sums up the present position as to the causation of the condition. Many theories have been advanced from time to time, and although some of them have now been given up definitely, it may be said that no definite causative factor has yet been recognised as playing a predominant part in the ætiology of this condition.

The facts to be borne in mind in discussing the causation of this disease are —

(1) That it is peculiar in that it occurs only during pregnancy, labour or in the puerperium.

(2) That primigravidae are much more frequently affected than multiparæ.

(3) The incidence of this disease is greater in certain abnormal conditions in pregnancy, such as twins, hydramnios, or hydatidiform mole.

(4) That the symptom complex of this condition, namely, — hypertension, albuminuria, etc. may result either in the occurrence of eclampsia or in concealed accidental hæmorrhage.

(5) That occasionally, without any obvious prodromal sign or symptom, the disease may manifest itself, sometimes in a severe form.

Among the many theories that have been advocated from time to time as to the causation of eclampsia are —

(1) *Uræmia*. The occurrence of albumin in the urine and the later manifestation of nephritis gave ground for the belief that eclampsia was akin to uræmia and that the convulsions were probably the result of actual renal insufficiency. We now know that albuminuria is not necessarily a symptom antecedent to the occurrence of eclampsia, and that the possibility is that the uræmic symptoms, if present at all, are secondary not primary.

(2) *Bacterial Theory*. It has been suggested that bacteria might be the cause of the toxæmia and that the disease may be due to a filtrable virus whose toxins may be responsible for the signs and symptoms. So far, however, no particular organism has been isolated, and it seems doubtful if this theory can explain all the facts concerning this condition.

(3) *Absorption of Intestinal Toxins*. It has been suggested that certain toxic protein derivatives which may be absorbed into the blood stream are not neutralised by the antibodies, or in some cases it may be that the antibodies are not sufficient to neutralise both the products of placental and foetal metabolism, as well as the toxic protein derivatives circulating in the blood stream.

(4) *Endocrine Disturbance* That the endocrines play a part in the physiology and pathology of pregnancy is becoming more clearly realised of late. One of the earliest to observe this was Lange who believed the thyroid was a factor in the causation of eclampsia and basing his views on this theory, Nicholson obtained favourable results with thyroid therapy in some cases of eclampsia. It is not quite certain whether any single endocrine can be held responsible as in all probability the intimate chain of interaction that exists between the various endocrine glands may be broken somewhere and so cause a disturbance in more than one, which results in the development of eclampsia. Much work yet remains to be done in this field and while the parathyroids, ovaries, corpus luteum have all been held responsible at some stage or other, recent observations go to show that the posterior pituitary may play a prominent part in the causation of this condition.

Anselmino and Hoffmann found a marked increase of the hormone of the posterior pituitary in the blood. Further investigation is necessary on this subject.

(5) *Effect of Dietary Alterations* The part played by diet in the causation of eclampsia has been brought to the forefront since the Great War. It was observed that in Germany during the last two years of the War, when conditions were most unfavourable for the proper supply of foodstuffs, and the civilian population was grossly underfed the incidence of eclampsia fell to nearly 25 per cent of what it was just before the War.

A clinical observation has been made that an excess of certain articles of diet particularly proteins and fats predispose to this condition while deficiency of diet in certain vitamins and minerals particularly calcium may lead to the manifestation of toxæmia.

(6) *Absorption of Fœtal Elements or Fœtal Metabolic Products* It has been suggested that eclampsia may be a form of anaphylaxis due to the introduction of a foreign protein which may be of fœtal origin. It is possible that certain of the fœtal elements or certain metabolic products from the fœtus may find their way into the maternal blood stream and give rise to a toxæmia.

It would appear from what has been stated above that no single theory is likely to prove satisfactory and explain all cases of eclampsia. It is possible that the term toxæmia covers a number of conditions which may be caused by different factors not all attributable to one particular cause.

It has been stated that the disease is relatively less common in warm climates or tropical countries. The actual incidence of the disease as proved by statistical tables quoted by different authors go to show that the disease is quite as common in the tropical countries as in the more temperate climates.

Pathology The organs chiefly affected in this condition are the liver kidneys and the brain. Secondary changes may be noted in the heart lungs spleen placenta etc.

Liver The most typical changes are to be found in this organ. The whole organ is pale yellow in colour with red areas underneath the capsule. There is fatty degeneration of the periphery of the lobules with capillary thrombosis and hæmorrhage.

Kidneys The changes noted in the kidneys are suggestive of a glomerulo nephritis. The glomerular capillaries are widened. Degenerative changes occur in the epithelium of the convoluted tubules which may vary from cloudy swelling and fatty degeneration to acute necrosis.

Brain Oedema of the brain is found in many cases and in a few hyperæmia without oedema and areas of thrombosis and capillary hæmorrhages may be met with.

The *lungs* are often normal. Sometimes oedema may be present or occasionally signs of pneumonia or broncho pneumonia. Degenerative changes occur in the *heart muscle* varying from cloudy swelling to fatty change. Sometimes thrombosis occurs.

The *placenta* may show areas of hæmorrhage and thrombosis with retroplacental clots in parts.

Clinical Signs and Symptoms In a large number of cases of eclampsia the signs and symptoms of pre-eclamptic toxæmia referred to are already present. In some cases however of the fulminant variety no signs or symptoms may be present and a fit may be the first warning of a severe form of toxæmia. The chief symptoms of an imminent attack of eclampsia are headache giddiness disturbances of vision such as dimness flashes of light photophobia or even complete blindness vomiting epigastric pain and a sinking feeling. Together with these symptoms a sudden rise of blood pressure particularly over 160 mm. diminution in the quantity of urine with albumin sometimes actual suppression would give a graphic picture of an imminent disaster in the shape of an eclamptic convulsion.

The Eclamptic Convulsion or the Fit When the woman actually develops the convulsive attack four stages may be recognised —

- (1) The premonitory stage
- (2) The tonic stage
- (3) The clonic stage
- (4) The stage of coma

The Premonitory Stage During this stage the patient becomes unconscious the pupils dilate the eyes are turned to one side and fixed or roll from side to side. twitchings of the face and hands may occur. This stage may last from a few seconds to half an hour.

The Tonic Stage The whole body now becomes rigid, the features are distorted, the arms flexed and hands clenched, the body being in a condition of tonic spasm. This stage lasts for a few seconds and is followed by the clonic stage.

The Clonic Stage In this stage there is alternate contraction and relaxation of the muscles, the jaw is clenched, the tongue may be bitten, the twittings begin in the face, around the angle of the mouth and gradually the arm and the leg on one side of the body, then the whole body is involved in the convulsive attacks. The face is cyanosed, and if the patient is not properly protected she may fall from the bed and injure herself, sometimes seriously. The tongue protrudes and in the clonic convulsions may be bitten badly. There is froth in the mouth, the breathing becomes stertorous. This stage lasts from half to two minutes and the patient then passes into the fourth stage, the stage of coma.

Coma In this stage the convulsive movements cease, a few jerks or twittings may take place at intervals. The patient lies quiet, stertorous breathing becomes established, coma supervening and the respirations gradually quietening down. In favourable cases the patient wakes after a short time and is not conscious of anything that has taken place before.

The temperature may rise during a fit, the pulse rate is increased and the blood pressure may be raised. The fits may occur every few minutes, but usually they come on at longer intervals of from twenty minutes to one hour. Sometimes, even after a single fit, the patient may pass off into deep coma from which she never recovers. In other cases fits may come on in quick succession and as many as eighty to a hundred fits have occurred *status eclampticus*, or, on the other hand, the patient may remain in a state of coma almost throughout. Again, in other cases the patient is quite conscious, but just before each fit works herself into a restless condition associated with delirium.

If albuminuria was not present before the attack it usually appears after the first fit. Reduction in the amount of urine is constant and in some cases there may be anuria.

Time of Onset of Fits Eclampsia is more frequent during the last trimester and may occur either—

- (1) Antenatally (intercurrent eclampsia) where the patient recovers from an attack and goes on to term,
- (2) Antepartum—occurring before the onset of labour, often leading to termination of pregnancy,
- (3) Intrapartum—occurring when the woman is in labour,
- (4) Postpartum—occurring for the first time after delivery or during the puerperium.

Postpartum eclampsia is much more frequent within the first twenty four hours after delivery. But cases have been reported and it is within our experience where the fits have appeared as late as twenty seven days after delivery. In cases of antepartum eclampsia labour pains may start a few hours after the eclamptic fit occasionally the woman may completely recover and pass through the later weeks of pregnancy and be confined at the normal period without any further trouble. This is known as antenatal or intercurrent eclampsia.

In the more favourable cases the convulsions gradually become less frequent and less severe. coma lightens temperature subsides pulse slows cyanosis disappears and the patient gradually recovers consciousness the blood pressure falls and the œdema decreases.

Occasionally mental disturbances may occur especially in the intrapartum and postpartum varieties of eclampsia. Disturbances of vision may persist and actual amaurosis may set in which lasts for a few days but permanent blindness is extremely rare.

Diagnosis Convulsions and coma being the chief symptoms of eclampsia it is necessary to bear in mind other conditions which may cause these symptoms during pregnancy. Among the conditions that may be responsible for the fits are —

- x (1) Epilepsy
- 1 (2) Hysteria
- (3) Uræmia
- (4) Cerebral malaria
- (5) Diabetes
- (6) Strychnine poisoning
- (7) Irritative cerebral lesions as meningitis and tumours

During pregnancy there is a tendency for exaggeration of the convulsive symptoms in these diseases. The history of the case a careful examination of the urine the blood pressure the character of the fits the presence or otherwise of œdema the examination of the retina and the result of a lumbar puncture would in the majority of cases serve to differentiate these conditions from true eclampsia.

In *epilepsy* there may be history of previous convulsions associated with typical aura. The contracted pupils the diminished or absent reflexes the low blood pressure and the absence of albumin in the urine are points in favour of epilepsy.

Hysteria will offer no serious difficulty in diagnosis. The absence of any injury the typical grotesque movements the consciousness the urinary findings the normal blood pressure the absence of cyanosis or stertorous respiration will point to a typical picture which cannot be confused with eclampsia.

Uræmia It is impossible to separate true eclampsia from uræmia unless there is a definite history of pre-existing nephritis.

Signs referable to the liver are more in favour of an eclamptic origin of the fits. Delirium, jaundice and the occasional presence of petechiæ may be suggestive of hepatic damage.

Strychnine Poisoning Here the typical convulsive seizures, together with the fact that the patient is conscious, the urinary findings, a fairly normal or slightly increased blood pressure, absence of retinal changes and the history would help to distinguish the condition.

In diabetic coma the history, the smell of acetone in the breath, the glycosuria and hyperglycæmia, air hunger, together with the absence of albuminuria, high blood pressure, etc., will serve to differentiate this condition.

Organic diseases of the brain may be diagnosed by the usual methods, and where there is doubt a spinal puncture may be required.

In the tropics a condition that may occasionally closely simulate an eclamptic attack is *cerebral malaria* occurring in pregnant women. The unconsciousness, the fits, the high temperature and occasional rise of blood pressure may simulate very closely an eclamptic fit. Worse still, in some cases a slight toxæmia in association with cerebral malaria may complete the picture suggestive of an eclamptic fit. The only method of differentiating between the two conditions is by examination of a blood film, which will reveal the presence of malarial parasites.

In every case of convulsions in pregnancy it is better to start with the presumption that they are eclamptic fits, till by differential diagnosis other causes have been definitely demonstrated.

Prognosis —Maternal The prognosis with any particular line of treatment should always be based on a large number of cases treated. Variations do occur as regards severity of the disease in particular areas and during particular seasons. It is not at all uncommon to find a series of cases responding very favourably to a particular line of treatment, but sooner or later cases occur in which the same method of treatment gives very unsatisfactory results. To speak of successful treatment in any short series of cases does not help to a true evaluation of such treatment. In fact no conclusions should be drawn unless a series of at least a hundred cases have been treated by a particular method.

Statistics from different centres go to show that there are wide variations in regard to mortality from this complication. While Stroganoff in a large series of cases has been able to show that the mortality is under 6 per cent, it has been as high as 35 to 40 per cent in some clinics. The average mortality may be said to be about 20 per cent. At the Government Hospital for Women and Children, Madras, there were 12 deaths among 148 cases during the last two years, i.e. 8.6 per cent.

The prognosis in this condition depends upon the following factors —

- (1) The number of fits their frequency and severity
- (2) The time of onset
- (3) The degree of coma
- (4) Temperature
- (5) Blood pressure
- (6) Pulse rate
- (7) Edema
- (8) Albumin
- (9) Other complications
- (10) The nature of treatment adopted

Fits—their frequency and duration The greater the number of fits the graver is the prognosis It has been found that if a patient has over twelve fits the prognosis is generally grave Prognosis also depends upon the time at which treatment is first started after the convulsions and the number of fits that the woman has had prior to the commencement of treatment Occasionally even a single fit may prove fatal The severity of fits the duration and frequency with which they occur are factors to be taken into account in arriving at the prognosis The more rapidly the fits recur especially if the patient does not recover consciousness in between and the longer they last the graver is the prognosis If the patient has had a number of fits prior to the commencement of treatment the prognosis is certainly more unfavourable

The Time of Onset As regards the time of onset the prognosis is more serious in the antepartum and intrapartum varieties than in the postpartum variety

Coma This is the most important factor to be taken into consideration in forming a prognosis The deeper the coma the more severe is the disease If the patient is conscious or only drowsy in between the fits the prognosis is better if she passes into deep coma after a single or even a few fits the prognosis is grave

Temperature Hyperpyrexia is definitely one of the worst prognostic signs in this condition If the temperature rises above 104° and keeps steadily at that level or rises higher the chances of recovery are small Mild degrees of fever within 102° may not necessarily be of bad prognostic significance Rarely do cases with hyperpyrexia recover

Pulse In individual cases the pulse is the best index If the pulse rate does not exceed 120 there is no immediate danger but if faster weak or compressible particularly with a low blood pressure the prognosis is bad

Blood Pressure It is difficult to ascertain from the blood pressure alone whether the prognosis is likely to be grave or not. Usually if it is above 150 mm the prognosis is not favourable. A steadily falling blood pressure in the absence of hæmorrhage or shock is of grave import. With a weak compressible pulse and low blood pressure the prognosis is grave. A persistently high blood pressure especially if it is above 200 mm is of bad prognostic import.

Œdema A limited amount of generalised œdema is not a bad sign but when it is generalised or severe or when there is no œdema the prognosis is not so favourable.

Albuminuria It is doubtful if the degree of albuminuria by itself gives us a definite indication as to the prognosis. Usually if albuminuria is of a high degree and persistent the prognosis is not favourable. Anuria hæmoglobinuria and severe albuminuria are of bad omen. If a high degree of albuminuria tends rapidly to decline with treatment the prognosis is more favourable.

Other Complications After delivery the patient has other risks to face. Complications of the lungs such as acute pulmonary œdema and particularly deglutition pneumonia are serious. Sepsis is common and when it does occur may run a more or less severe course. Apoplexy when it does occur is almost always fatal.

The later complications may be aphasia mental derangements hemiplegia or loss of sight.

A point of considerable significance to be noted is the ultimate prognosis as opposed to the immediate. Many a woman may apparently recover from an attack of eclampsia but later suffers from permanent damage particularly of the kidneys. It has been noted that a woman who has had an attack of eclampsia always suffers from a vitiated obstetric life subsequently. Abortions are more frequent premature deliveries antepartum hæmorrhage and toxæmias in subsequent pregnancies are by no means uncommon. But the chief stress seems to be on the kidneys and this is manifested at subsequent pregnancies by the reappearance of albumin and by other signs of toxæmia.

The term *occult nephritis* has very rightly been given to the condition where there is not any definite sign of renal damage in between pregnancies but once the woman becomes pregnant even as early as the twentieth week signs of renal damage begin to manifest themselves. It is well to note this fact as the whole outlook as regards treatment of toxæmias has changed since there has been a better realisation of the severe damage likely to occur to the kidneys by prolonged albuminuria high blood pressure and other signs of pregnancy toxæmia. The longer these symptoms are allowed to persist during pregnancy the greater is the possibility of permanent damage to the kidney and if the toxæmia continues

for more than two weeks it is almost certain that permanent renal damage will result

We have classified cases of eclampsia under four heads —

- (1) The hepatic type,
- (2) The renal type,
- (3) The neural type, and
- (4) The mixed type,

depending upon the degree of involvement of the liver kidney, nervous system, or a combination of any of these

In the *hepatic type* it would appear that the main damage is to the liver, and such cases are generally associated with absence or low degree of albuminuria, a fairly high blood pressure and very little of œdema

In the *renal type* there is a high degree of albuminuria, œdema may be prominent, general anasarca may sometimes be present and the blood pressure is raised occasionally being very high. Retinal changes may also be noted

In the *neural type* few premonitory signs and symptoms may be noted. The convulsions come on suddenly, are severe and frequent. Albuminuria and œdema are absent and a rise in blood pressure is not appreciable

In the *mixed type* any combination of these signs and symptoms may be present

It should now be more clearly realised how any one sign albuminuria or high blood pressure, cannot by itself give us a sufficient indication as to the prognosis in a particular case, and hepatic involvement if serious would appear to give a worse prognosis than renal involvement, while the neural type is the worst of all

Fœtal Prognosis The fœtal prognosis is definitely bad in cases of eclampsia. Nearly half of the children are still born or die in the neonatal period. The chief factors that are responsible for this heavy mortality are prematurity, toxæmia, the effect of treatment of the mother upon the fœtus and asphyxia

Complications These are —

(1) Injuries varying from bruises to fractures. The tongue is usually bitten and in some cases it may be so badly injured that it gets swollen, may fall back and occlude the glottis during the period of unconsciousness, causing suffocation and even fatal asphyxia

(2) Cerebral hæmorrhage may occur

(3) Hyperpyrexia is a grave complication

(4) Œdema of the lungs or broncho pneumonia may sometimes occur

(5) Heart failure is not uncommon

- (6) Mental instability has already been referred to
- (7) Jaundice is an unfavourable symptom when it does occur
- (8) Retinal changes
- (9) Septis may develop in a few cases

Treatment—Prophylactic We have already referred to prophylaxis in connection with pre-eclamptic toxæmia. A rational method of prophylaxis is not possible till the exact causation of the condition is known, but experience has shown that it is possible in the very large majority of cases to prevent the onset of eclampsia. Very rarely, however a case occurs without any premonitory signs or symptom and such a case is generally of a severe type. Efficient antenatal care frequent examination of the urine (noting the quantity and albumin content) estimation of the blood pressure and the weight of the patient together with eliciting a careful history and warning the patient as to the significance of particular symptom, would go far to lessen the incidence of this condition. Proper antenatal hygiene and a well regulated dietary with elimination of certain articles, are of great import. In particular the bowels should be well opened. If in spite of the hygienic routine laid down symptoms of toxæmia appear the patient should be at once put to bed and a strict prophylactic treatment adopted on the lines suggested in the previous chapter on albuminuria of pregnancy.

In cases that do not respond promptly to treatment the question of termination of pregnancy should be boldly faced especially in view of what has already been stated that the longer the toxæmia is allowed to persist the greater is the possibility of permanent damage to the kidney.

Curative When in spite of prophylactic treatment eclampsia manifests itself a definite and detailed line of treatment should be followed. Nothing is more distressing than to jump from one method of treatment to another in the necessarily anxious time when the patient does not show any immediate sign of response. We feel that in the long run the obstetrician will realise that keeping on to one particular and well known method of treatment is of greater benefit to the patient than vainly trying every new method that has been advocated rushing from one to another.

Two definite lines of treatment are in vogue —

- (1) The conservative treatment and
- (2) The radical treatment

In the *conservative* line of treatment the patient is subjected to medicinal methods of treatment and termination of pregnancy is not effected by any radical methods.

On the other hand, the advocates of the *radical* treatment believe that immediate delivery is the most important factor in the

treatment of eclampsia. They hold that eclampsia is the result of some abnormal processes connected with the foetus *in utero* and the sooner the uterus is emptied the better it is for the patient. Statistics have been quoted in plenty to support this line of treatment but on the whole it may be said that at present it has not found any very large support among obstetricians. We shall refer to the details of this method of treatment later.

CONSERVATIVE TREATMENT

This is by far the most commonly adopted method of treatment and while variations are necessarily to be found in the details the main principles are the same. We shall describe some of the common methods of treatment.

Stroganoff's Treatment

Stroganoff has given the following scheme of the improved method in the treatment of eclampsia. —

During the fits the patient should be protected against injuries the tongue protected from being bitten and oxygen should be given after the fits to counteract asphyxia. Chloroform is harmful in typical fits but if the patient is restless it is useful.

The general principles of treatment are —

(1) **Removal of all Sources of External Irritations.** The patient should be kept in a darkened room free from noise and any examination reduced to the minimum.

(2) **Administration of Narcotics.** Morphine and chloral hydrate according to directions below. —

At the commencement of treatment $\frac{1}{4}$ to $\frac{1}{2}$ grain morphine hypodermically.

One hour later 30 to 40 grains chloral hydrate per rectum or per os.

Two hours later $\frac{1}{4}$ to $\frac{1}{2}$ grain morphine hypodermically.

Four hours later (seven hours from commencement of treatment) repeat the chloral hydrate 30 to 40 grains.

Six hours later (thirteen hours from the beginning of treatment) 24 to 32 grains of chloral hydrate.

Eight hours later (twenty one hours after commencement) repeat the above treatment.

When the patient is conscious chloral hydrate is introduced per os with 2 to 4 oz of milk and in the unconscious condition per rectum with milk and physiological saline $3\frac{1}{2}$ oz each. The dose is increased in the case of severe eclampsia in strong individuals and diminished for mild forms.

Chloroform, $\frac{1}{2}$ to 2 drachms, is administered in the presence of a fit

On the second day undelivered patients receive 16 to 24 grains chloral hydrate three times a day in the absence of fits during fourteen hours, and when the patient has not any prodromata or fits the dosage may be diminished

(3) **Venesection** If fits occur two or three times, or even once in severe form, in spite of administration of morphine and chloral hydrate, it is necessary to perform venesection, drawing off 14 oz of blood This is not resorted to if delivery is expected within the next one or two hours

(4) **Delivery** As soon as the eclamptic patient can be delivered without harm to herself and child, delivery is undertaken either with forceps, or rarely by extraction after podalic version if necessary In the absence of any contra indication the bag of membranes is ruptured, if the os has dilated to two fingers in a multipara and about three fingers in a primigravida

(5) **Maintenance of Regular Functions of Chief Organs —**

(a) **Kidneys and Skin** The patient is kept warm with hot-water bottles placed at the knees and in the region of the abdomen Hot tea diluted with milk should be given to conscious patients, unconscious patients must be given milk and physiological salt solution about 14 oz per day, usually with chloral hydrate, per rectum

(b) **Lungs** Oxygen is given after a fit, and by removal of all hindrance to the respiratory movements a supply of pure warm air is ensured Unconscious eclamptic patients should be kept chiefly on the right side Careful cleansing of the mouth and nose from mucus, blood and vomited matter is necessary

(c) **Heart** If the pulse rate is 110 or higher, give digitalis and when the heart is still weaker, camphor and caffeine Continuous observation of the patient and her child is needed for twenty four hours after delivery

In very severe cases, 144 grains of chloral hydrate and $\frac{1}{2}$ grain of morphia are introduced in the course of fourteen hours, and chloroform narcosis may be necessary several times until the fits cease

The Dublin Method

This method of treatment has been followed at the Rotunda Hospital for a number of years and was first suggested by Tweedy when he was Master of the Rotunda Hospital The chief principles underlying this treatment are *starvation and elimination*, together with the use of *certain selected narcotics* to keep a control over the fits The method originally advocated by Tweedy seems to have undergone some change in the hands of subsequent Masters

of this hospital and Bethel Solomons the late Master, has given the following details of the treatment as now practised at the hospital —

"Nursing" This is a most important part of the treatment, and we have saved more lives by carefully watching our patients than by any other means. During a fit the mucus pours out of her mouth like water from a tap and unless the woman is hastily brought over to the edge of the bed, with her mouth towards the floor, the tongue brought forward the mucus removed from the mouth and back of the throat, she will surely die. In addition it may be necessary to perform artificial respiration and oxygen will help to save the life. Immediately it is discovered that eclampsia is present she is put in a quiet room and given morphine. The room must not be dark for the patient must be visible. She is put lying on her right side. A gag is ready and something to prevent her from biting her tongue.

"If she is conscious" she is given mixture senna co 3 oz. the morphine treatment is started, colon lavage gastric lavage submammary infusion if necessary. Plenty of water is given.

"If she is unconscious" the same treatment is carried out except that the patient cannot take water nor can a purge be administered.

"Morphine" We are firm believers in morphine for the treatment of eclampsia. Our routine consists of $\frac{1}{2}$ grain with the first fit and $\frac{1}{2}$ grain with each fit, up to 2 grains for the twenty four hours, but two hours must elapse between each dose. That is if the first dose is at six, the next not to be before eight the next ten, and so on.

If the respirations become slow atropine $\frac{1}{100}$ grain is given with the morphine. If the rate goes below nine to the minute stop the morphine and give atropine alone with if necessary oxygen.

Poultices to the Loins These are applied to assist in the secretion of urine. They should be removed every two hours and they should be hot but not too hot for the skin of the toxic patient is highly sensitive to the heat.

"Colon Lavage" The patient is turned on her left side and a long soft rubber tube lubricated with glycerine is pushed through the anus high up into the rectum. The bowel is washed out with warm water, precisely as the stomach was washed out using a pint of water at a time and continuing the washing till the faeces do not stain the return flow. Colon lavage is repeated three or four times daily in a severe case.

"Gastric Lavage" This is done when the patient is vomiting, or when she is so unconscious that the only means of giving a purgative is by the tube. The gastric lavage should be repeated if the vomiting does not stop or if she is still unconscious and it is necessary to give purgatives into the stomach. Before withdrawing

the tube we introduce into the stomach 3 or 4 oz of mistura senna co or 2 oz of castor oil We then pour down 2 or 3 oz. of bicarbonate solution

Submammary Solution If the patient is not improving if her pulse is weak and thready if there is insufficient secretion of urine sodium bicarbonate solution 1 drachm to each pint of infusion under each breast This is an important part of the treatment

Glucose is useful in all toxæmias for most of the patients are suffering from acidosis

Treatment with regard to the Birth of the Child If the patient recovers from eclampsia and is near term it is well to induce labour when she is well over the fits Labour should be terminated when all conditions which allow immediate delivery are fulfilled that is when the patient is in the second stage and termination of labour will not be a shock to her

Anæsthetics Chloroform may not be used Open ether is the anæsthetic we use when necessary

Cesarean section is scarcely ever indicated in our practice

Arnold and Fay's Method

Arnold and Fay have recently described a method of treatment for eclampsia by means of fluid limitation and dehydration The treatment outlined by them provides —

(1) For a primary sedative directed towards the control of the convulsive seizures

(2) For the early use of hypertonic solution to attract into the blood stream the tissue bound water

(3) For immediate and rapid cerebral dehydration by spinal drainage or venesection which is an extremely important factor not only in controlling convulsions but in bringing about early mental restoration with all its advantages in the further conduct of the case

(4) The use of an active saline purge to withdraw the fluid from the blood stream reclaimed by the intravenous glucose and thus hasten a re-establishment of body water balance

The authors of this method of treatment by fluid balance and dehydration claim that it has proved very satisfactory in their hands the merit of this method consists in the stress laid upon the fluid balance but further recorded results are awaited before its place as a definite line of treatment for eclampsia can be assessed

The Author's Treatment

We shall now give in detail the treatment that has been practised by us for some years. The general principles followed are —

- (1) Administration of sedatives
- (2) Starvation
- (3) Elimination and dehydration
- (4) Reduction of blood pressure
- (5) Non interference with labour except under certain definite conditions—even then to a limited extent
- (6) Treatment of complications

As soon as possible after the patient has been admitted if she has had fits recently or is likely to develop a fit as judged from her restless attitude she is given an injection of $\frac{1}{2}$ grain morphia with $\frac{1}{100}$ grain of atropine sulphate and transferred to a separate room which is used only for purposes of treating eclamptics. It is desirable to isolate the patient in this manner both for her own sake and to prevent unnecessary alarm in the common delivery room used for other patients. The room is so furnished that the patient can be treated for the eclampsia and delivery effected by operative procedures if necessary. The patient is put on a special eclamptic bed which has got side supports about 9 ins. high so that during a fit she may not fall down and seriously injure herself. If the patient is restless at the time of admission it is usual to give her an injection of morphine before proceeding with the necessary examination. If this precaution is not taken even such procedures as abdominal palpation, catheterisation or vaginal examination may occasionally provoke a severe convulsive fit. We are not in favour of the administration of chloroform to control the fits except on rare occasions such as in the condition of status eclampticus or to help delivery during the second stage of labour. Perfect quiet should be maintained in this room and all sources of irritation must be avoided. The patient is left in charge of a trained nurse accustomed to deal with eclampsia and its complications.

When the patient has been put on the eclamptic bed all tight fitting clothes are loosened, jewels removed and the patient carefully examined as regards her temperature, pulse, respiration, blood pressure, urine analysis, the height of the uterus, whether in labour or not, and if in labour the condition of the cervix and the extent of its dilatation and other incidental factors necessary for a correct estimation of the probable course of labour.

The treatment for eclampsia can be considered under the following headings —

- (1) Treatment during a fit
- (2) Prevention of fits
- (3) Management of labour
- (4) Prevention and treatment of complications
- (5) After treatment

Treatment during a Fit During a fit the woman is likely to injure herself by falling down or biting her tongue. It is therefore necessary to see that she is kept in a properly prepared bed, either with side supports or with assistants standing by and carefully watching her. A mouth gag is inserted to prevent the patient biting her tongue. Care should be taken to see that the mouth gag is properly inserted between the molar teeth, as otherwise during a fit the insertion of the gag in between the incisors may easily cause dislocation of the teeth. The gag should be inserted as soon as the first signs of the fit are apparent, in fact, in some cases it may be desirable to insert the gag when the patient is inclined to get restless. As soon as the fits have ceased the mouth gag should be carefully removed, taking care to see that the tongue is within the mouth and not protruding.

All tight fitting clothes should be removed, particularly on the chest as they are likely to embarrass respiration.

Occasionally during a fit the respiratory rate may slow down and even stop temporarily, and artificial respiration must be performed under such circumstances, together with inhalations of oxygen.

The mouth should be cleared of all mucus immediately after a fit and the tongue should be kept as clean as possible, it is preferable to make the patient lie on her sides alternately after the fit is over with the head at a lower level to prevent the mucus and saliva flowing into the upper air passages and later producing hypostatic congestion of the lungs or deglutition pneumonia. The patient is preferably put more often on her right side than her left to relieve any pressure upon the heart which is already working against heavy odds.

Prevention of Fits This is our immediate objective, and so long as we are not definitely in a position to ascertain the particular ætiological factors and thus control the condition the treatment must be largely empirical being based upon experience. It is for this very reason that there is such wide variation as to what is necessary and what is not in the methods of treatment advocated. Our own experience is that the fits are most often controlled by the method given below.

Immediately after a fit the patient should be given an injection of morphine tartrate, $\frac{1}{4}$ grain, with atropine $\frac{1}{100}$ grain. This

may have to be repeated twice or thrice at intervals if fits should recur. The atropine is given so as to prevent congestion and œdem of the lungs so likely to occur in this condition particularly when morphia is administered. The morphia should be repeated only at intervals of two hours and it is rarely necessary for the total amount to exceed 2 grains in the twenty four hours. In cases where the patient still continues to be restless or the fits recur chloral and bromide per rectum (30 grains of chloral hydrate with 30 grains potassium bromide) have proved effective when given at intervals of from two to three hours.

Simultaneously with the administration of morphine it is important to reduce the blood pressure which is done by injection of $\frac{1}{2}$ c.c. of veratrine the active principle of *veratrum viride*. Veratrine produces a fairly sharp drop in the blood pressure and should therefore be administered only in those cases where the systolic blood pressure is above 140 mm. We have very rarely felt the need for giving more than $\frac{1}{2}$ c.c. veratrine and it has been our experience that larger doses sometimes produce unfortunate results. Such large doses as $\frac{1}{2}$ to 1 c.c. produce a very sharp fall in the blood pressure accompanied with severe vomiting and symptoms of collapse. Even with the small dose used the blood pressure may drop too low sometimes below 60 mm. and in such cases glucose and saline per rectum have to be given to counteract the temporary condition of extreme hypotension.

Particular stress should be laid upon the fact that starvation and elimination with dehydration form an essential part in the treatment of eclampsia. So long as the patient is unconscious or subconsciously she should not be given nourishment by mouth and it is our practice not to allow anything for at least twelve hours after she has regained consciousness. The administration of any food even fluids not only serves as a source of irritation but is likely in the condition of semi-consciousness to lead to troublesome lung complications some of the fluid gravitating into the upper air passages. The importance of starvation and elimination has been rightly emphasised by Tweedy and we owe it to him that we have a clearer realisation of the fact that even the blandest form of fluid diet may predispose to the occurrence of fits.

If the patient is conscious at the time of admission she should immediately be given a large saline purgative 1½ oz. of mag. sulph. in concentrated solution. If she is unconscious a large boric bowel wash should be given repeated at four hourly intervals and as soon as she regains consciousness sufficiently the saline purgative ought to be given. Occasionally a saturated solution of mag. sulph. may be left in the bowels after a bowel wash.

A method of treatment that has been discarded by us for some years is gastric lavage. Our experience is that it is not only

unnecessary but positively harmful. Washing out the stomach is attended with such an amount of irritation to the patient that fits are provoked, and to administer chloroform and so avoid this is not desirable in view of its adverse effect on the liver and the increased possibilities of regurgitation of fluid during the sub-conscious stage. Our experience goes to prove that one of the serious risks of eclampsia, namely, lung complications, has been largely eliminated since gastric lavage was given up.

If a high blood pressure should persist, and especially if there are signs of failure of the right side of the heart, venesection is performed and 20 to 30 oz. of blood withdrawn. In cases where the patient is in the second stage of labour and delivery can be effected we do not advocate venesection, as the termination of labour is accompanied by sufficient loss of blood to lower the blood pressure.

Management of Labour. The question of management of labour arises in cases of antepartum or intrapartum eclampsia. So far as antenatal eclampsia is concerned, if the signs and symptoms abate with the treatment outlined above the patient gradually recovers consciousness and there is no need to interfere with the course of pregnancy. The patient under such circumstances will gradually show a decided improvement which is noted by the fact that the blood pressure steadily falls, that the albumin in the urine decreases and ultimately disappears and the oedema subsides. If such progress is maintained the pregnancy is allowed to continue, care being taken to see that the patient is constantly watched and kept under observation and that the restrictions with regard to diet, etc., to be outlined later, are strictly followed. In particular, the patient should be told about the warning symptoms of threatening eclampsia and advised to seek medical assistance forthwith if any of these symptoms manifest themselves. It is preferable, however, that such a patient should be hospitalised till the delivery is over.

In spite of treatment some of the more important signs and symptoms of toxæmia may not abate, although the patient may recover from the eclamptic attack. Thus the blood pressure may persistently remain high or albuminuria continue. Under such circumstances, if after two weeks of treatment there is no definite improvement, the question of termination of pregnancy should be faced. The necessity to terminate pregnancy at this stage arises out of two considerations.—

- (1) The persistence of the severe signs of toxæmia is always suggestive of a recurrence of the eclamptic condition at any time. In such cases it is not always possible to control the attack and a fatal result may sometimes ensue.

- (2) Another equally important consideration from the point of view of the remote prognosis is the permanent damage that may be done to the kidneys if such signs and symptoms of toxæmia are permitted to persist

These signs of permanent renal damage may show themselves in one of two ways —

- (a) As signs and symptoms of chronic nephritis or
- (b) As signs and symptoms suggestive of occult nephritis

In the former case the resultant degenerative condition in the renal tissues will become manifest during the puerperium or a little later and will continue just as an ordinary case of chronic nephritis may after an attack of acute nephritis. The patient has in fact passed on to the condition of chronic nephritis.

In the latter case that is in occult nephritis the condition is more difficult of appreciation except when the woman becomes pregnant again. Although the damage to the kidney is permanent it is not sufficiently pronounced to show the ordinary manifestations of renal damage between pregnancies. When however the woman becomes pregnant again the stress involved would seem to exacerbate this condition and between the twentieth and twenty eighth weeks of pregnancy the signs indicating the presence of a nephritis manifest themselves. Hence this condition is known as *occult nephritis*.

It would appear from what has been stated above that when toxæmic symptoms persist after the antenatal eclampsia for over two weeks it is very desirable to terminate pregnancy as otherwise either of the two sequelæ referred to above may show itself.

It may in this connection be stated that a rapid onset of toxæmia with as sudden recovery is less likely to lead to permanent damage of the kidney than a more slow and insidious attack lasting for a longer period and probably running a more chronic course. Hence in conditions of toxæmia of pregnancy a careful watch should be maintained on the duration and course of the toxæmia and as has been mentioned under pre eclamptic toxæmia steps should be taken to terminate pregnancy if there is not a definite improvement and the toxæmic symptoms do not completely disappear within a fortnight after the treatment is commenced.

In cases of antenatal and antepartum eclampsia where the fits persist in spite of treatment the termination of pregnancy by conservative methods has proved beneficial and should be adopted irrespective of the period of pregnancy.

The mode of termination of pregnancy is a matter of importance. In cases near term medicinal methods of induction of labour may

be sufficient for this purpose. More often perhaps particularly if the pregnancy has not reached term and the fœtus is premature medicinal methods fail. It is also worth noting that pituitary extracts which are used in the usual medicinal method of induction are not desirable when the toxæmic condition is present as they are likely to raise the blood pressure and thus precipitate a fit. For these reasons other methods of induction must be thought of. The two methods most often resorted to are —

- (1) Krause's method by insertion of bougies and
- (2) Rupture of membranes

We have recently adopted the practice of rupturing the membranes artificially low down in all cases where the fits are not easily brought under control. Our experience goes to show that this is a valuable method of controlling the fits in the majority of cases and labour follows within a few hours and terminates quickly improving the prognosis for the mother.

A third method is Cæsarean section. We do not advocate this method and we feel that it is not desirable to perform a Cæsarean section in a woman who is suffering from toxæmia unless it be that there are other indications unassociated with toxæmia such as a contracted pelvis, concealed accidental hæmorrhage, placenta prævia. We consider that the strain of a major operation adversely affects the patient who is already suffering from the toxæmic strain on the heart, damaged kidney and a nervous system which is in a condition of explosive irritability.

Management of Labour in Intrapartum Eclampsia. Here the position is different. The woman is already in labour and the question arises what assistance should be given by the obstetrician. We have held the view and constantly practised it that no interference is indicated in the early stages of labour but that labour should be helped in the second stage as much in the interests of the mother as of the fœtus. The reason why we prefer to terminate the second stage by artificial methods is two fold —

(1) In the interests of the mother. It is well known that in eclampsia there is a great deal of strain on the heart and it has to work against the increased high blood pressure. If to this is added the strain of a prolonged second stage when the accessory muscles of labour are brought into play it is obvious that occasionally the heart may be more severely strained than is desirable. There is no purpose in increasing the strain at this stage and for this reason when the dilatation is complete and the head is in the midcavity instead of waiting for the termination of labour by natural powers we prefer to apply forceps and deliver. In breech presentations extraction may be usefully done under such circumstances.

(2) In the interests of the fœtus This may not be quite so well appreciated, but our experience is that the fœtus in an eclamptic is more likely to suffer from the toxæmic condition of the mother after the membranes have ruptured than before and that the longer it is left inside the uterus after rupture of the membranes the greater is the danger involved and the possibility of asphyxia. For this reason we prefer, in the interests of the fœtus, to terminate the second stage as early as possible.

An additional factor is that the method of treatment adopted has also a bearing upon this. Morphine is our sheet anchor in the treatment of eclampsia to produce a sedative effect and morphine given fairly late in labour is, it is well known deleterious to the interests of the fœtus, and so as not to allow too much time after the rupture of the membranes for the effect of morphine to manifest itself upon the fœtus, we prefer to deliver it at an earlier stage. We strongly hold that forcible methods of delivery have no place in the management of labour in an eclamptic.

Prevention and Treatment of Complications The complications that are likely to occur in the course of eclampsia have already been mentioned. The majority of them can be avoided with careful nursing and prompt attention to details.

Injury to the Tongue and Lips It has already been stated that care should be taken to see that the tongue is not bitten during a fit. A mouth gag should be handy and should be inserted by being pressed in between the molars and so long as the fit continues the gag should be kept in position. Should the tongue and the lips be bitten, a careful watch must be kept during the unconscious condition to see that the tongue does not roll back and occlude the glottis and thus interfere with respiration. It is also important to ensure that a tongue which is bitten or lacerated is properly cleaned and, if necessary sutured. Consequent upon the retention of mucus and the dribbling of saliva a fetid odour in the mouth is not uncommon in unconscious eclamptics and careful nursing is required to see that saliva and mucus are not allowed to accumulate, and that the mouth is frequently cleaned with gauze soaked in an antiseptic such as Condy's fluid and that the tongue and lips and the gums are smeared with glycerinum boracis.

Pulmonary Complications These are very frequent in eclampsia and can to a large extent be avoided by careful nursing. The unconscious or subconscious patient should not be allowed to lie on her back, as the mucus and the saliva which are secreted freely tend to gravitate into the upper air passages and lead to infection of the lungs. For these reasons the nurse should turn the patient from one side to another, preferably to the right side more often, to avoid any stress upon the heart. Occasionally a mild attack

of broncho pneumonia is inevitable. In some cases owing to the increased blood pressure and the consequent failure of the left side of the heart œdema of the lungs appears.

Hyperpyrexia This is a most troublesome complication when it does occur. The exact causation of this condition is not known; it does not depend upon the number of fits or upon the severity of the attack. We have seen the condition in patients who have had a few attacks as well as in cases where a large number of fits have occurred. If the temperature persists above 104° the prognosis as has already been stated is grave. A constant watch should therefore be kept over the temperature and every effort should be made to bring it down by the application of an ice cap, cold sponging of the extremities, iced enemata if necessary and by other antipyretic measures.

In the tropics particularly during the hot weather hyperpyrexia may cause incalculable harm. It is necessary under these circumstances to keep the temperature of the room as cool as possible so that the condition is not influenced adversely by the extreme heat of the surrounding atmosphere.

Mental Disturbances These are by no means infrequent in eclampsia and follow antepartum, intrapartum and postpartum varieties. Usually the type of disturbance is mania. The patients are extremely violent, restless, incoherent in their talk and require considerable skill to manage. Fortunately, in the large majority of cases the attack lasts for a short period, twenty-four to forty-eight hours and gradually tends to subside. In other cases it may be more persistent and may last for a week or a fortnight but gradually tends to lessen in its severity after the eclamptic condition has subsided. The mental symptoms are aggravated if puerperal sepsis is present.

The treatment of this condition consists in the administration of sedatives, bromides in large doses per rectum. Luminol may be given in some cases. It may be necessary to give morphia to quieten the patient. In others again a straight jacket or delirium sheet may be necessary to prevent the patient from harming herself. Care should be taken to see that the patient is properly fed at regular intervals. Nasal feeding may have to be resorted to sometimes. The bowels must be kept free and the genital passages properly protected to prevent the possibility of septic infection.

Cardiac Failure One of the chief conditions which may cause anxiety is failure of the myocardium. It is obvious that owing to the toxæmia, the increased high blood pressure and the condition of the lungs the heart is working at a great disadvantage and in some cases cardiac failure does occur. Careful watch therefore must be kept over the condition of the heart and suitable stimulants administered. Among the stimulants that have been found useful

are camphor in oil coramine cardatone musk and ether digitalin etc As general stimulants glucose with small quantities of brandy can be given by mouth when the patient is in a conscious condition Rectal saline may sometimes be useful

Septic Complications These are troublesome to deal with when they do occur It is best to prevent their development Care in the conduct of labour scrupulous cleanliness the minimum amount of artificial interference and meticulous care in the puerperium are most likely to eliminate the possibilities of such a complication When puerperal sepsis does occur it must be treated along the lines suggested in the chapter on sepsis

Occasionally, owing to the necessity for catheterisation a *bacillus coli* infection of the bladder may occur Under such circumstances urinary antiseptics large doses of barley water etc are needed to combat this

Visual Disturbances In the majority of cases of toxemia mild disturbances of vision occur Amblyopia photophobia retinitis partial blindness detachment of retina etc are not infrequent Extremely rarely total blindness may occur We have observed a case where such total blindness manifested itself on the seventh day after the eclamptic attack but fortunately vision was restored after a week Cases are however recorded where the blindness has been permanent

Other complications such as jaundice cerebral hemorrhage etc, should be treated symptomatically

The After-Care of the Eclamptic The after treatment of an eclamptic is just as important as the treatment during the actual condition It has already been stated that nothing should be given by mouth until the patient is fully conscious and we prefer not to give anything for at least twelve hours after the patient has regained consciousness If however the patient is very insistent and complains of extreme thirst small quantities of barley water glucose or fruit juice may be given during this period When the patient is completely conscious the diet depends upon the condition of the blood pressure and quantity of albumin in the urine It is better for the first twenty four hours not to give the patient anything except water aerated drinks and fruit juice After this period and provided the blood pressure has fallen and the albumin has considerably diminished the patient may for the next three or four days be kept on a diet of milk barley water glucose and fruit juice We do not give more than a pint of milk in the twenty four hours care being taken throughout this period to watch the trend of the blood pressure and the quantity of albumin in the urine On the first sign of increasing blood pressure or albuminuria all diet should be interdicted and only the blandest fluid, such as water and glucose water should be administered

If however the condition of the patient is progressively improving after the fifth day the quantity of milk may gradually be increased and if the albumin totally disappears it is permissible to give the patient some solid diet such as bread or soft boiled rice with milk. We prefer this strict dietetic regimen for ten to fourteen days after the complete cessation of the fits. We have seen that temporary indiscretions have resulted in a recurrence of the fits as late as the fourteenth day after the first attack. Besides the dietetic regulations care must be taken to see that elimination is maintained. For this purpose a saline purgative is generally given every day in the form of 2 to 4 drachms of mag sulph given in single or repeated doses. Barley water or very mild diuretics may be useful in increasing the quantity of urine secreted. If suppression of urine however occurs this should be treated by hot poultices around the kidney region in the loins and sometimes cupping may be useful.

The importance of good after care during the puerperium has already been emphasized with a view to eliminating the possibility of septic complications.

RADICAL TREATMENT

So far we have expressed our views on what may be called the conservative line of treatment of eclampsia but there is another school of thought which believes that rapid delivery is the logical method of treatment in eclampsia. It holds that eclampsia is the result of some abnormal process in the ovum and not till the foetus and placenta are removed will the source of the toxæmia be eliminated. Thus the rationale of emptying the uterus is based upon the theory that the active factor concerned in the causation of the condition is the presence of the products of conception.

The method of effecting delivery depends upon several factors such as the period of pregnancy the surroundings of the patient the presence of any complications the condition of the cervix and whether or not the patient is in labour. *Accouchement force* or rapid methods of dilatation of the cervix followed by immediate delivery have now been completely given up by most obstetricians and even the advocates of a rapid method of delivery are agreed that such methods are not to be thought of as they lead to a heavy incidence of maternal mortality. Rapid methods of delivery may be either through the vaginal route or through the abdominal route. If the cervix is not dilated and the patient is not in labour the abdominal route is to be preferred. If however the patient is in labour then it depends upon the condition of the cervix. Occasionally multiple incisions of the cervix dilatation with hydrostatic dilators if necessary and emptying the uterus by forceps

or by version and breech extraction may be the methods of choice. Others again have advocated vaginal Cesarean section provided the pelvis is not contracted and the child can be easily delivered.

We do not propose to go into details regarding these methods of treatment as we hold strongly that radical methods of treatment such as these have no place in the treatment of eclampsia.

OTHER METHODS OF TREATMENT

Besides those already mentioned there are certain other methods of treatment adopted by some obstetricians for this condition. Among these may be mentioned —

(1) **The Administration of Magnesium Sulphate** Intravenous injections of magnesium sulphate have been practised for some time now. The rationale of the treatment is that it helps to abstract water from the tissues into the blood stream and thereby reduces the œdema, lessens cerebral irritation and relieves the comatose condition, lowers the blood pressure and simultaneously favours diuresis. An intravenous injection of 10 c.c. of a 20 per cent solution of magnesium sulphate is advocated in toxemias of pregnancy and may be repeated daily if the blood pressure does not fall. In cases of eclampsia 20 c.c. of a 10 per cent solution should be given as soon as possible and repeated every hour if the fits do not stop or if the blood pressure remains high. We have tried it in a few cases but we are not satisfied that this method has given any better results than the methods already advocated.

(2) **Intravenous Injection of Glucose** It has been suggested that one of the methods of lowering blood pressure and favouring diuresis is by the intravenous injection of glucose. 500 c.c. of 20 per cent glucose solution is injected intravenously and if well borne another 500 c.c. may be given every two hours subject to a maximum of 2500 c.c. during the twenty four hours.

(3) **Lumbar Puncture** This has been advocated as another method of lessening the possibilities of fits. It is well known that the intracranial pressure is increased in some cases and lumbar puncture may by relieving the tension lessen the number of fits. We have not found it useful by itself but in combination with other methods of treatment it may find a place in some selected cases.

(4) **Venesection** We have already referred to the possibilities of venesection in the treatment of eclampsia. When the blood pressure remains persistently high in spite of the administration of veratrine and other methods outlined, the question of venesection—withdrawing 20 to 30 oz. of blood—may be considered.

(5) **Thyroid Therapy** Basing his conclusions on the endocrine ætiology of the condition, Nicholson advocated the use of thyroid

extract in the treatment of eclampsia. It would appear that eclampsia is due to a relative deficiency of thyroid and an increase of the posterior pituitary hormone, and for this reason thyroid extract in doses of 20 grains of the desiccated glandular substance has been administered orally. Liquor thyroidei may be used hypodermically in doses of 10 minims till the pulse quickens.

THE QUESTION OF FUTURE PREGNANCY

The obstetrician is occasionally consulted after the recovery of the patient as to the desirability of risking a future pregnancy. It is very difficult under certain circumstances to give definite advice on this point, but every effort should be made carefully to ascertain the condition of the kidneys by examining the urine and by renal efficiency tests. If there is no evidence of kidney damage the patient should be advised to allow a period of three to four years to elapse before risking the chances of another pregnancy. This is due to the possibility of occult nephritis persisting, which condition cannot easily be diagnosed. Even after that time has elapsed the patient should be advised to seek medical aid from the commencement of the next pregnancy and to submit herself to treatment if necessary. If, however, a woman has shown evidence of toxæmia at two or more pregnancies, it should definitely be stated that she is unfit for conception; and in such cases we prefer that the patient should be sterilised if she is willing.

Concealed Accidental Hæmorrhage

In some cases of pregnancy toxæmia associated with albuminuria and high blood pressure, antepartum hæmorrhage occurs, the hæmorrhage being not infrequently concealed. In such cases hæmorrhages into the uterine musculature may be present. It has been observed that in severe cases of toxæmia one of two possible terminations may take place: the patient may develop the convulsions of eclampsia or sudden intra-uterine hæmorrhage occurs, being of the concealed accidental hæmorrhage type. In such cases, owing to the damaged uterine musculature, there is greater tendency for the blood to be concealed, the fœtus generally dies *in utero*, and labour may be complicated by postpartum hæmorrhage. Once the intra uterine hæmorrhage occurs the blood pressure falls, the albumin tends gradually to disappear and the patient seldom develops fits. In cases of severe toxæmia the prognosis is a little more favourable if accidental hæmorrhage occurs instead of eclampsia.

The symptoms, pathology, prognosis and treatment of this condition are dealt with in detail in the chapter on antepartum hæmorrhage.

CHAPTER XVII

DISEASES COMPLICATING PREGNANCY

DURING the course of pregnancy a woman can be affected by any of the diseases to which she is liable in the non gravid condition. In most cases pregnancy aggravates the disease and the disease itself may have an adverse effect on the pregnancy. The latter possibility is more likely in certain types of diseases than in others. There are several factors which have a bearing upon the degree to which pregnancy may be influenced unfavourably by the particular disease. Speaking generally it may be said that all diseases which cause an elevation of temperature are likely to have a deleterious effect upon the course of pregnancy and in particular upon the life of the foetus. Thus in acute infectious diseases the tendency is for interruption of pregnancy and intra uterine death of the foetus to occur. This is more marked in those diseases where the range of temperature is high and particularly where it is associated with sudden variations. For example in cases of relapsing fever malaria etc. the chances of abortion or premature labour with intra uterine death of the foetus are greater. The effect of the temperature on the foetus is very marked as the temperature of the foetus is habitually higher than that of the mother and maintains a relatively greater height when the mother's temperature becomes abnormal. The foetus dies from the effects of increased temperature before such increase becomes fatal to the mother. The temperature of the mother if only raised for a short period above 106° is fatal to the foetus.

Again the general effect of fevers on the foetus is more felt in the early or late months of pregnancy at either of which period abortion or premature labour is likely to occur. Sudden variations of the temperature are more likely to cause premature delivery. The higher the range of temperature the more likely is the occurrence of premature labour.

Another fact to be noted is that in diseases associated with cyanosis or respiratory embarrassment death of the foetus *in utero* and interruption of pregnancy are more frequent. Thus in cases of pneumonia premature delivery is very liable to occur as well as abortion. The increased viscosity of the blood would appear to stimulate the uterus to contraction and cause expulsion of the foetus.

In a third variety of diseases the acute exanthemata the infection would appear to affect the foetus and intra uterine death of the foetus is by no means uncommon.

In acute diseases associated with extreme collapse of the pregnant woman such as cholera acute dysentery death of the foetus generally takes place and labour may be precipitate

On the other hand there are certain diseases such as tuberculosis heart disease and certain anæmias where in spite of the adverse effect upon the mother the fœtus is not affected and is born fully developed and apparently healthy. In such cases it would appear as if the fœtus had a parasitic existence upon the mother and retained its vitality at the serious expense of the host.

It is impossible to deal in a work of this kind with all diseases that may occur during the course of pregnancy as it more properly belongs to the domain of Medicine but we shall refer to a few of the more common and important diseases that not infrequently affect the pregnant woman —

- (1) Diseases of the cardiovascular system
- (2) Diseases of the respiratory system—
 - Tuberculosis of the lungs
 - Lobar pneumonia
- (3) Acute infectious diseases—
 - Influenza
 - Typhoid fever
 - Variola etc
 - Relapsing fever
- (4) Specific diseases—
 - Syphilis
 - Gonorrhœa
 - Infective granuloma
- (5) Tropical diseases—
 - Malaria
 - Kala azar
 - Blackwater fever
 - Cholera
 - Filariasis
 - Beri beri
 - Leprosy
- (6) Helminthiasis—
 - Ankylostomiasis
- (7) *Diseases of the blood—*
 - Anæmias
 - Pernicious anæmia
 - Secondary anæmias
- (8) Diseases of the urinary system—
 - Pyelitis
 - Nephritis
- (9) Diseases of metabolism—
 - Diabetes
- (10) Diseases of the endocrine system—
 - Exophthalmic goitre
 - Myxœdema

- (11) Diseases of the gastro intestinal system—
Dysenteries
- (12) Diseases of the nervous system—
Chorea
Epilepsy
Peripheral neuritis
- (13) Deficiency diseases—
Osteomalacia
Sprue
- (14) Diseases of the skin—
Albinism
- (15) Surgical affections during pregnancy—
Appendicitis
Intestinal obstruction

DISEASES OF THE CARDIOVASCULAR SYSTEM

The cardiovascular system is subjected to increased strain during the later weeks of gestation and especially during the course of labour. There is a mechanical impediment to the free action of the heart and to the circulation owing to the enlargement of the uterus incidental to pregnancy. Particularly is this marked if any abnormalities are associated with this enlargement as in cases of hydramnios, plural pregnancy and tumours complicating pregnancy. The respiratory embarrassment that necessarily follows increases the strain upon the heart under such circumstances. In the normal gravid woman the heart is able to cope with the increased strain and no serious disturbance occurs. On the other hand when the heart is in a diseased condition there may be variable degrees of response to the increasing strain of pregnancy depending in particular upon the condition of the myocardium. The strain upon the heart is more particularly felt in certain stages of pregnancy and labour —

- (1) In the early weeks when nausea and vomiting are prominent and when the nutrition of the patient is seriously interfered with
- (2) In the later months when owing to the increased size of the uterus and the pressure exerted upon the diaphragm and the lungs impeding free respiratory movements myocardial insufficiency may occur
- (3) In the second stage of labour when more than at any other time the strain on the weakened musculature of the heart is most felt

The common affections of the heart noted during pregnancy are those of the myocardium and of the valves. Very often the two conditions are found in association one being the result of the

other The common forms of valvular diseases of the heart that may be met with are mitral stenosis with or without regurgitation aortic regurgitation and aortic stenosis with regurgitation Of these mitral stenosis and aortic regurgitation are the most serious among valvular diseases

In mitral stenosis the strain upon the left auricle the pulmonary circulation and the right ventricle is very great, and in view of the fact that in the later weeks of pregnancy respiration is embarrassed by the growing uterus respiratory complications and involvement of the myocardium are not uncommon In all cases of chronic valvular diseases of the heart or of the myocardium the most important thing to note is the response of the patient to ordinary physical activity Can she carry on without discomfort or stand any additional effort? The reserve capacity of the heart is of the utmost importance This is estimated by the response of the heart to effort Where there is evidence of cardiac failure having occurred either before or early in pregnancy the condition should be looked upon with grave suspicion When actual decompensation exists the woman runs a grave risk There is dyspnoea cyanosis a tendency for cardiac asthma sleeplessness and restlessness and occasionally Cheyne-Stokes' respirations may occur Oedema is an important manifestation of cardiac failure and is more liable to develop in mitral than in aortic lesions It usually commences in the most dependent parts and generally is first noticed around the ankles in the evenings Even in severe cases oedema may be confined to the lower extremities As oedema occurs from a variety of causes in pregnant women it may not be seriously taken note of in the earlier stages Later the oedema may involve the serous membranes resulting in ascites hydrothorax and occasionally hydropericardium bronchitis bronchopneumonia and hæmoptysis are not uncommon The hæmoptysis is generally the result of chronic venous congestion The liver may be enlarged and tender These late manifestations of decompensation of the heart are of grave prognostic significance and their development should if possible be prevented by suitable treatment in the earlier stages

Effect of Pregnancy on Heart Disease It has already been stated that in view of the demands of the growing uterus there is an increased strain upon the heart which is liable to result in increased damage Not infrequently such strain may lead to failure of compensation This is more likely to occur in multigravidae than in primigravidae The degree of decompensation depends on the condition of the myocardium and the amount of strain to which the patient is subjected Sudden death is not unlikely in cases of cardiac failure and in many of these cases *premature labour occurs before collapse of the patient*

cases there is no cardiac reserve and they are in imminent danger of collapse on the slightest strain more so during labour

MANAGEMENT OF CARDIAC CASES

When a case of heart disease is met with in pregnancy it is important to make a thorough investigation of the case and to ascertain the following particulars —

(1) The causative factors involved in the cardiac disease—that is whether the disease is congenital or acquired. If acquired the part played by rheumatic infection in the production of the condition and the period of life when it first occurred. It is also necessary to find out whether there have been any exacerbations of the condition in recent years and whether recurrent attacks of rheumatic fever have led to further damage to an already diseased heart.

(2) The exact nature of the lesion must be ascertained whether it is a valvular condition or whether the myocardium and the pericardium have been involved. In particular the condition of the myocardium should be noted.

(3) In every case the response of the myocardium to effort must be carefully noted. The extent to which the patient possesses a reserve power to cope with any increased strain is a valuable index as to how the heart will stand the strain of pregnancy and labour.

(4) The previous history of the heart lesion should be ascertained when the first symptoms manifested themselves when a recurrence was noted whether there was any decompensation and if so how often and at what periods? The factors concerned in the causation of the decompensation and how far and how readily it responded to treatment. The period that has elapsed between the last attack of decompensation if any and the present period of pregnancy should also be noted.

(5) The presence of any complications at the time of examination should be noted and a history of any complications at previous attacks of decompensation should be ascertained.

A careful examination is necessary to ascertain —

- (a) The condition of the lungs
- (b) The condition of the arteries
- (c) The condition of the liver
- (d) The presence or absence of any œdema particularly of the lower extremities
- (e) The condition of the kidneys the presence of albuminuria with casts
- (f) The blood pressure systolic and diastolic
- (g) The character of the pulse the degree of anæmia if present any gastro intestinal disturbances and such other signs or symptoms as may be suggestive of a derangement of any particular organ

(6) The number of the pregnancy and the particular period of pregnancy should be noted together with the presence of any anomalies such as displacements of the gravid uterus or contraction of the pelvis

In cases where previous deliveries have taken place after the development of the heart lesion a careful history must be elicited as to the response of the heart during the period of pregnancy at the time of labour and during the puerperium. The presence or absence of any decompensation at any one of these periods should particularly be noted as well as the nature of the delivery

Having ascertained all these factors we may now proceed with a more thorough consideration of all the issues involved in cases of heart disease complicating pregnancy. The stage at which a woman may come under observation may be —

- (1) Early in pregnancy that is within the first twelve to sixteen weeks
- (2) In the second trimester of pregnancy—before the thirty second week
- (3) In the last weeks of pregnancy or actually when she is in labour or immediately after confinement or in the puerperium

We shall take each of these conditions separately and discuss them

A CARDIAC DISEASE COMPLICATING PREGNANCY IN THE FIRST TRIMESTER

When a patient is seen at this period a very careful investigation should be made of all the factors that have a bearing upon the cardiac disease. We have already referred to these factors. In particular the age of the patient the parity the nature of the lesion the condition of the myocardium the presence of any dilatation the blood pressure systolic and diastolic presence of complications in the lungs any suggestive signs of decompensation the condition of the kidneys of the liver and of the stomach should all be noted. A hæmatological examination is also useful.

At this period of pregnancy the patient may present herself in one of three stages —

(1) **Patients in the Early Weeks of Pregnancy, with Organic Heart Disease, but able to carry on Ordinary Physical Activity without Discomfort.** In such cases the patient should be taken completely into one's confidence and the position clearly explained as to what risks she is liable to run if certain precautions are not taken. She should be given detailed

instructions as regards the hygiene of pregnancy, especially in regard to :—

- (a) Diet.
- (b) Exercise.
- (c) Regulation of bowels.
- (d) Regular periodic visits to the obstetrician or the antenatal clinic.
- (e) *Any warning signs or symptoms of decompensation.*

The diet should be well balanced with adequate vitamin supply and mineral content and should not contain any indigestible elements. Milk, vegetables, fruits, delicate meats such as fish and chicken are desirable. In particular, beef, pork, and all fatty and rich meat should be avoided. Succulent vegetables are better ; vegetables which are bulky and difficult of digestion, such as potatoes, roots, etc., should be avoided.

Regarding exercise much will depend upon her tolerance ; but it is well to restrict it to mild forms of exercise and never to perform them till actual fatigue is reached. So far as occupations are concerned it is advisable to restrict them within definite limits so that fatigue or breathlessness may not result. If absolutely essential for livelihood only light occupations for short periods should be accepted.

The bowels should be regulated. It is not advisable to allow constipation to occur. The diet will probably help in regulating the bowels, but if necessary mild laxatives may be given.

The patient must report herself to an antenatal clinic or to the obstetrician concerned at least once a month, so that the extent to which the heart continues to respond to the growing demands of pregnancy may be watched. She should be particularly advised to seek immediate medical aid if there is any breathlessness, cough, fatigue on exertion, palpitation, œdema of the extremities, giddiness, or any other symptoms suggestive of developing decompensation.

If any of these symptoms of decompensation become manifest, the patient comes under the next category of cases, namely :—

(2) **Patient with Organic Heart Disease, unable to carry on Ordinary Physical Activity without Discomfort.** The degree to which such discomfort is experienced may vary, so that the activity may be slightly limited or it may be greatly limited and associated with complications such as engorgement of the veins of the neck, crepitations at the bases of the lungs, enlargement of the liver with tenderness and tachycardia. In the latter group of cases signs of decompensation may be constantly present and they will naturally fall into the third category of cases to be dealt with later.

In this second group the patient should have perfect rest. She must lie in bed for the greater part of the day, no exercise of any sort is permissible. The bowels must be well regulated and the diet should be light and nutritious. The general condition of the patient should be improved, hæmatics administered if necessary, and the patient's condition carefully watched and cardiac tonics given.

(3) Patients showing Definite Evidence of Decompensation Such patients should preferably be treated in institutions. Careful nursing and absolute rest in bed are essential. They ought to be kept under continuous observation throughout the course of pregnancy until delivery has been effected. Prolonged rest in bed, with cardiac tonics and other measures to be outlined later, depending upon the extent of decompensation and the nature of the lesion, should be adopted.

Among the several methods of treatment to be adopted in conditions where the heart threatens to decompensate, or shows signs of actual decompensation, are —

Diuretics and Cardiac Tonics Among the diuretics may be mentioned caffeine sodium benzoate preparations of theobromine, etc. These are particularly applicable in conditions where œdema is present. Salyrgan has been occasionally found useful in 1 to 2 c.c. of 1 per cent solution given intravenously. The mercurial and bismuth diuretics are usually best avoided in the therapy of œdema in pregnancy except where œdema is the result of syphilitic cardiac or syphilitic renal disease.

Diet In the presence of œdema the water and solid intake should be drastically reduced. The total fluid should not be over 1000 c.c. per diem. In such patients milk, fruit juice, glucose and such nutritious diet without any solids should be administered. A diet of low protein value with a minimum amount of solid is satisfactory for a few days or even a week.

Digitalis Therapy This is particularly indicated in cases of decompensation with auricular fibrillation, ventricular tachycardia, or auricular flutter and in cases of congestive heart failure, especially if the amount of urine is diminished or dropsy is present. It is valuable in all cardiac lesions, and while the drug is likely to prove far more effective when cardiac failure is associated with auricular fibrillation or auricular flutter with a rapid ventricular rate, it is also of value in cases of rapid ventricular rate with a normal rhythm. It is more useful in mitral than in aortic cases. The object of digitalis therapy is to produce a cumulative effect and thereby obtain its full therapeutic value. To obtain this the drug should be given in greater quantities than it is excreted, and once the objective has been reached the doses should be reduced to the optimum level so that the intake and the excretion may

be balanced. There are various methods of pushing digitalis in such cases but it is better to spread the dose over twenty four hours and watch the effects of the drug on the pulse and the output of urine. If vomiting is present, digitalis may be administered per rectum or hypodermically. The symptoms of over-dosage of digitalis are anorexia, nausea, vomiting, headache and diarrhoea. The pulse should be carefully watched for any signs of undue slowing and the heart for evidence of extrasystoles or even of ventricular tachycardia. When evidence of toxic symptoms appear, the drug should be stopped for at least twenty four hours, after which it may be administered in diminished dosages.

Among other drugs that may be given are strychnine, diffusible stimulants like alcohol, ammonia and ether, camphor in-oil injected intramuscularly and such compounds on the market as cardiozal, coramine, carditone etc.

Glucose is of value in the treatment of congestive heart failure and should be generously given by mouth. To produce quiet and freedom from excitability or irritability, and to favour sleep, *bromides* are useful. Occasionally *morphia* is indicated for this purpose.

For the dropsy, hypertension and distension of the right side of the heart purgatives are valuable, preferably saline purgatives. The value of diuretics has already been mentioned. In cases of respiratory embarrassment *oxygen* is of great value, particularly in the presence of cyanosis and dyspnoea. In pulmonary oedema, infarction or hydrothorax it is usually required and should be administered continuously through a nasal catheter or by means of a special mask.

Venesection. In some cases this may be resorted to, but except as an emergency measure it has not proved of much value in cases of decompensation.

Symptomatic treatment for other conditions may also be desirable.

Management of Pregnancy. We have deferred to the last the question of the management of pregnancy. When the patient presents herself with a cardiac lesion and pregnancy, the question has to be answered whether she can stand the strain of pregnancy or whether pregnancy should be terminated. In the majority of cases if the patient's general condition is favourable, and she can be classified under group (1) above, pregnancy may be allowed to progress as long as the patient is subject to a continuous close watch. Where the patient is grouped under (2) and (3) above, that is where signs of decompensation threaten or are already present, the immediate indication is to treat the cardiac condition. No question of terminating pregnancy arises at this stage and, what is far more important, it is dangerous to interfere with pregnancy at a stage when, owing to decompensation, the patient's strength

has to be fully conserved to cope with the cardiac condition. In the majority of cases with the methods of treatment suggested above the patient will respond satisfactorily. Once the compensation has been restored the pregnancy may be continued care being taken to see that as far as possible all such factors as are likely to favour decompensation are eliminated.

A problem of greater difficulty arises at this stage. Should decompensation recur in the later weeks of pregnancy what may be the end result? In view of this fear it is sometimes permissible to consider whether in the lucid interval when the general health of the patient is good steps should not be taken to terminate pregnancy. We are inclined to this view especially if there has been a history of repeated decompensations before pregnancy and during the earlier period of pregnancy. Such cases always give rise to acute cardiac failure either in the last weeks of pregnancy or at the time of labour. The environment of the patient and the facilities available for prolonged rest in bed and suitable treatment are also to be taken into consideration. If it is decided to terminate pregnancy owing to the possibility of cardiac failure occurring in the later stages of pregnancy the mode of termination is extremely important. The best method of termination of pregnancy is by abdominal or vaginal hysterotomy. If abdominal hysterotomy is performed the opportunity may be taken to sterilise the patient at the same time. The operation can be done under a local anaesthetic and is generally devoid of risk if performed during the lucid interval. In some cases however where pregnancy has not progressed beyond the twelfth week induction of abortion by the usual methods of cervical dilatation and evacuation may be resorted to.

B MANAGEMENT OF CASES OF CARDIAC LESION WITH PREGNANCY IN THE SECOND TRIMESTER

During this period the patient when first seen may be classified under any of the three groups mentioned above. The same principles of treatment as have already been outlined should be adopted.

So far as pregnancy is concerned it may be necessary to adopt a more conservative attitude. Not infrequently if cardiac failure sets in premature labour may result. In such cases the patient runs a grave risk of collapse after delivery. This will be referred to in dealing with cardiac failure at the time of labour.

If the woman however has not started labour the treatment outlined for decompensation should be vigorously pushed and no attempt made to induce labour. In such cases if response is noticed one is inclined to allow pregnancy to continue in the hope that the woman may be delivered of a live child at or near term.

Should however decompensation of varying degrees persist in spite of treatment the woman runs a grave risk. Under such circumstances the obstetrician may be tempted to terminate pregnancy in the vain hope that some alteration of the condition may result therefrom. Our experience is that such interference is an insult to the damaged and overstrained heart and should therefore never be attempted. In cases however where labour occurs spontaneously the second stage of labour should be assisted as detailed below.

C MANAGEMENT OF CARDIAC LESIONS IN WOMEN IN THE LAST TRIMESTER OF PREGNANCY

In these cases the most important points to be considered are —

(1) The extent to which the cardiac musculature is able to respond to effort

(2) Presence or absence of signs or symptoms of cardiac failure

Besides the hygienic and general measures that should be adopted as already suggested it is well for the obstetrician to note carefully any anomalies in regard to presentation position nature of the pelvis etc.

In the absence of cardiac decompensation the question of the management of labour comes up. The adverse consequences of the voluntary effort required in the second stage of labour cannot always be avoided. Delivery should be completed with as little strain on the heart as possible. In multiparæ with a history of easy delivery it is permissible to allow nature to proceed and to terminate the second stage as early as possible by artificial assistance that is by the application of forceps or version and breech extraction according to the needs of the case. In primiparæ and in those cases where any abnormalities of presentation position or of the pelvis are present the question of delivery by a lower segment or classical Cæsarean section should be seriously considered. The question of the anæsthetic is of paramount importance. A local anæsthetic is to be preferred wherever possible.

D MANAGEMENT OF CARDIAC PATIENTS DURING LABOUR

In cases where the woman is actually in labour it is important to note whether there are any signs of cardiac failure or not. If such signs be not present the same general principles about the management of labour as in cases of cardiac lesion in the last weeks of pregnancy should be adopted.

During the first stage of labour the patient should be at rest and if necessary sedatives may be given. Glucose and fruit juice may be given. The bowels should be relieved by enemata.

The second stage is assisted to relieve the strain on the heart imposed by the accessory muscles of labour coming into play

Conservation of strength is of great importance Every care should be taken during delivery to avoid the risks of sepsis Immediately after delivery collapse may occur, so oxygen inhalations, cardiac stimulants, general stimulants, saline and glucose intravenously must be available The patient should be given such liquid diet as will supply her with ready energy

The third stage of labour is quite as important as any from the circulatory point of view Dangers of postpartum hæmorrhage should be reckoned with, sudden syncope is not uncommon The patient should be kept on the delivery board for some time and should not be shifted too soon

Where decompensation is already present the risks of labour are very great indeed All measures suggested for relief of decompensation should be adopted Rapid methods of delivery should never be attempted in the presence of decompensation More harm will result than good by such meddling interference Where there is failure of the right side a mild degree of postpartum hæmorrhage proves beneficial In some cases, where engorgement of the veins of the neck and congestion of the liver are prominent, venesection may be useful

Puerperal sepsis is a complication of grave import during the postpartum period

E MANAGEMENT DURING THE PUERPERIUM

After delivery the patient should be very carefully watched during the puerperium She must not be allowed to sit up too early and all fatigue should be avoided The bowels should be kept open, she may be allowed to nurse the baby if her general condition permits it Prolonged rest in bed for weeks is desirable A carefully regulated diet, light and nutritious, plenty of fresh air, suitable tonics hæmatinics and freedom from mental and physical strain are essential for a safe convalescence

FUTURE PREGNANCIES

As regards future pregnancies the patient should be cautioned about the dangers If signs of decompensation have been present during the course of pregnancy every additional pregnancy adds very materially to the risks that the patient undergoes The fact that the patient has successfully been pulled through one pregnancy does not justify the hope that she may have a similar favourable termination in the next Even in those cases where no abnormalities have occurred pregnancy is risky—much more so if it should occur after only a short interval Perhaps the best treatment, where

definite organic lesion associated with cardiac failure has occurred, is to advocate sterilisation of the patient

HEART DISEASE AND MARRIAGE

Should a patient with organic heart disease marry? This question is as often asked of the obstetrician as of the physician, and the advice to be given will depend upon the circumstances of each case. It is easy to draw a lurid picture of what may happen and to advise against matrimony and motherhood, on the other hand human instincts and human tendencies must be considered, and no such easy method of escape is possible for the obstetrician who wishes conscientiously to discharge his duties. In coming to a judgment the factors to be taken into consideration are the ætiology of the cardiac lesion the nature of the lesion and whether it is quiescent active or progressive the reaction to effort under present circumstances and the adequacy of the reserve force. The patient should be given frankly the opinion as to how far pregnancy may shorten her span of life or render her more liable to serious risks. In cases where the heart lesion is marked and congestive failure has been present it is rational to prohibit child bearing. Even in other cases the risks of pregnancy and labour should be fully explained and the final decision left to the person concerned.

It is common to advocate contraception in these days for such cases. Without entering into any controversial discussions as to the value and the place of contraception in diseased conditions, it is pertinent to observe that contraception is not a wise method in cases of heart disease. The strain the anxiety and the probable failure all throw such a heavy burden upon the young woman, while she may escape one danger she will probably fall into another.

Occasionally in such cases it has been suggested to carry out sterilisation so that the dangers of motherhood at least are no longer present. All factors must be considered before giving definite advice in an individual case and no hard and fast rules can possibly be laid down.

CHAPTER XVIII

DISEASES OF THE RESPIRATORY SYSTEM COMPLICATING PREGNANCY

Tuberculosis of the Lungs

By far the commonest form of tuberculosis that may be met with in women of the child bearing period is tuberculosis of the lungs. Occasionally one meets with cases of tuberculosis of the glands or of the bones complicating pregnancy. Not infrequently an old

tubercular caries of the spine which has healed up may be met with, giving rise to complications in labour owing to the associated pelvic deformity. Rarely abdominal tuberculosis and pregnancy co-exist.

That pulmonary tuberculosis has a very deleterious influence upon progeny is becoming more and more well recognised. The question is often asked whether in the presence of tuberculosis marriage is desirable. The answer is obvious. A woman with tuberculosis is likely to suffer in a more aggravated form from the effects of the disease during pregnancy or immediately after delivery, secondly, the children are likely to be predisposed to tuberculosis and the danger of infection is very great in the family. If, however, the disease has been controlled and an interval of two to three years of complete quiescence has been noted, marriage may perhaps be permitted. Taking all factors into consideration it is unnecessary to prohibit marriage, but when such marriage has been permitted the married couple should be advised strongly as to the necessity for prudence and care. All excesses should be avoided, and it would be as well if there should be a period when the adjustment in regard to the marital relationship is unhampered by the possibilities of gestation. If the strain is not attended with any exacerbation of the old focus, the possibilities are that the woman may go through pregnancy and be delivered without much added risk. It should, however, be realised that an old healed up tuberculosis may at any time give rise to a recrudescence of the trouble, and this is most favoured if there be frequent child births. The need for spacing of pregnancy is greater in the tuberculous woman than in others, and it cannot be sufficiently emphasised that if marriage be permitted in healed up cases of tuberculosis there is necessarily a limitation as to progeny.

So far as women with open tuberculosis are concerned there is no doubt that marriage should be discouraged. If signs of active tuberculosis are found in a woman who has already married every care should be taken to see that she does not risk conception. In some cases it may even be necessary to suggest sterilisation as the only safe method of preventing conception.

INFLUENCE OF PREGNANCY ON TUBERCULOSIS

There is still a great deal of difference of opinion among obstetricians and physicians as to the effect of pregnancy on tuberculosis. While one group believes that pregnancy very definitely aggravates tuberculosis, another group is of the opinion that tuberculosis is probably benefited by pregnancy, while a small number believe that it has no effect whatsoever on the progress of tuberculosis. Obviously much depends upon the tubercular focus and whether it is quiescent or active.

The worst period of pregnancy so far as the tubercular patient is concerned is the first trimester when the incidental complications such as morning sickness nausea etc undermine the strength of the patient to such an extent that there are possibilities of a latent infection becoming active, or of an active lesion being aggravated.

During the second trimester this tendency is not so marked while in the last months of pregnancy generally there is an apparent improvement. This may be due to the fact that the growing uterus gradually presses upwards particularly between the thirty second and fortieth weeks and produces a condition akin to artificial pneumothorax. It may be that this associated with the general care of the pregnant mother at this stage, is responsible for what appears to be an improvement in her general health.

Whatever may be the effect of tuberculosis on pregnancy, there is no doubt that during the puerperium the disease generally tends to manifest itself in a very aggravated form. Why exactly this should occur is not very clear but in the majority of cases the disease makes itself quite evident by a sharp recrudescence at this period. It has been suggested that the sudden emptying of the uterus and the consequent release of pressure may produce a favourable condition for the dissemination of the tubercle bacilli. Whatever may be the cause, clinical experience makes it clear that the time which is to be most dreaded in cases of tuberculous women is during the puerperium and not so much during pregnancy.

EFFECT OF TUBERCULOSIS ON PREGNANCY

Tuberculosis does not affect fertility except in those cases where the disease is in an advanced condition or in tuberculosis of the genital tract or of the adnexa. Pregnancy is not interfered with and usually the child is well developed. Cases have been recorded where tuberculosis has been transmitted to the foetus *in utero* but the greater danger is the possibility of infection of the new born from the mother by close contact and association.

TREATMENT OF TUBERCULOSIS

We have already referred to the prophylactic care required in women with tuberculosis. It has been suggested that a woman with tuberculosis should not marry and marriage is permissible only if the infection has been quiescent for at least three years. Even in such cases it is not advisable that conception should take place for some time after marriage and during the later periods the offspring should be strictly limited and the pregnancies spaced out so that frequent child bearing is avoided.

When however pregnancy does take place the patient should be under constant care. Occasionally the woman may present

herself with tuberculosis complicating pregnancy for the first time. The question that has been prominently raised is whether pregnancy should be terminated in such cases. At one time opinion was widely prevalent that termination of pregnancy was the safest course to adopt. Experience has, however, shown that such an extreme view is not tenable, that in the large majority of cases the woman may be taken through the whole course of pregnancy and be safely delivered, and that on the other hand the termination of pregnancy does not necessarily ensure safety for the mother. With the modern methods that are now available for the treatment of this condition there does not seem to be much justification for termination of pregnancy in this condition. If however there be evidence of active tuberculosis early in pregnancy and the patient is suffering from fever, wasting, laryngeal tuberculosis or hæmoptysis the pregnancy should be terminated. Similarly when other complications such as nephritis, heart disease or hyperemesis are present in a tubercular pregnant woman, termination of pregnancy would appear to be the safer course.

When it is decided that pregnancy should be terminated the question arises as to the mode of termination. The old method of inducing abortion and completing the evacuation of the uterus at two sittings does not appear to be a satisfactory method. Vaginal or abdominal hysterotomy and evacuation of the uterus with sterilisation if necessary, would appear to be far safer, particularly if the pregnancy has advanced beyond twelve weeks. In cases where pregnancy is allowed to continue care should be taken to see that the patient is kept in the best of surroundings, that the diet is regulated and that suitable measures are taken to treat any other symptoms that may arise. Sinatorium treatment, artificial pneumothorax and medicinal treatment should be adopted. Cod liver oil, particularly valuable on account of its fat soluble vitamin A content, creosote, hypophosphites, nascent iodine, calcium may all be used. It is not possible during pregnancy to attempt any of the major operative measures such as thoracoplasty, apicolysis or evulsion of the phrenic nerve. Artificial pneumothorax may sometimes be performed in the early weeks of pregnancy and is most desirable during the puerperium for reasons to be mentioned later. Together with these symptomatic treatment to alleviate the cough, fever, night sweats or hæmoptysis and the gastro intestinal symptoms may be necessary.

MANAGEMENT OF LABOUR

So far as labour is concerned it should be borne in mind that the patient is not in a position to stand the strain of labour to any great extent. As soon as dilatation of the cervix is complete and the

greatest diameter of the head has passed through the brim of the pelvis it is desirable to help delivery by means of forceps. Every effort should be taken to see that the hemorrhage in the third stage is limited.

THE CARE OF THE PUERPERIUM

This is perhaps the most anxious time in a tuberculous woman. We have already referred to the fact that at this stage there is a tendency for an exacerbation of the disease. Lactation should be strictly forbidden, the child should be removed and separately looked after. Great care should be taken to see that there is little or no risk of puerperal infection, and it is at this stage that we recommend artificial pneumothorax. It has already been stated that while in the later weeks of pregnancy the enlargement of the uterus presses upon the diaphragm and produces a condition of collapse of the lung akin to artificial pneumothorax, when delivery has taken place and the pressure thus relieved it would appear to favour an exacerbation of the disease. We therefore recommend that at this stage artificial pneumothorax would be a useful method of keeping up the intrathoracic pressure with a view to favour a partially collapsed state of the lungs. The patient should be advised to take particular care for at least six months after delivery, and thereafter she should lead a well regulated life and should avoid all possibilities of conception for some years, the minimum is three preferably five years and the number of offspring should be limited to two or three.

So far as the offspring is concerned there can be no doubt that it is safest not to allow the mother to nurse the child. This advice is necessary for two reasons. First, lactation has got a prejudicial effect upon the recovery of the patient, and secondly, whatever may be the apparent state of health a tuberculous mother may infect her offspring by close proximity, and therefore not only should nursing be forbidden but the mother should be restrained from having her child too near her. If sufficient care is taken there is no reason why the child should not escape the possibilities of tubercular infection.

Lobar Pneumonia

This condition when it occurs in pregnancy is likely to lead to interruption of pregnancy. The two factors which may bring this about are the high elevation of temperature and the comparative anoxæmia that sets in.

The effect of temperature on the fœtus has already been detailed in the introduction to this chapter.

So far as respiratory diseases are concerned, it may be stated that where cyanosis is marked during the course of the disease,

premature delivery is very liable to occur. In cases of lobar pneumonia the enlarged pregnant uterus restricts the movement of the diaphragm, so that there is greater dyspnoea and cyanosis. The work of the heart is likewise increased, so that cardiac failure may occur earlier and in a greater percentage of cases than in the non gravid condition. Abortion or premature labour, therefore occurs more frequently in this condition and at the height of the disease when cyanosis and respiratory embarrassment are marked. The condition of the mother is further aggravated by the strain due to labour, thus diminishing the chances of recovery. In nearly 50 per cent of the cases pregnancy is interrupted spontaneously more frequently in the later months. The mortality is therefore considerably increased.

The effect on the foetus is also very grave. If of viable age and born alive it may die soon afterwards either from the infection itself *in utero* or from other causes associated with the onset of premature labour.

There is a possibility of puerperal infection due to the pneumococcus.

Treatment It is obvious from what has been stated above that during pregnancy every care should be taken to avoid the possibilities of exposure to conditions which are likely to lead to respiratory troubles and particularly to pneumonia. When there is any respiratory trouble during pregnancy particular care should be taken to see that the patient is at once put to bed and watched. The disease should be treated along the usual lines adopted in the non gravid condition. Drugs should be used only for definite indications. Care should be taken to examine the heart frequently and to support its activity by the judicious use of cardiac stimulants. Cyanosis may be relieved by increased oxygen intake. In recent years specific therapy for pneumonia has been advocated and various sera are on the market for this purpose.

So far as the management of pregnancy is concerned it should be clearly understood that interruption of pregnancy in the presence of lobar pneumonia is detrimental to both mother and child. If labour becomes inevitable efforts should be made to hasten the delivery in the second stage and thus lessen the strain on the maternal heart. The application of forceps in suitable cases or extraction of the foetus is desirable. Circulatory failure may be precipitated by the rapid fall in the blood pressure associated with labour. Intravenous administration of digitalis or strophanthus may be necessary.

During the puerperium and in the convalescent period the patient should have a nourishing diet and a fairly long rest the condition of the heart being carefully noted.

Acute Infectious Diseases

The pregnant woman is just as susceptible or perhaps even more so than the non pregnant to any of the acute infectious diseases that may be prevalent in the locality. The disease is generally aggravated by pregnancy and has a deleterious effect upon pregnancy. Abortion or premature labour is not infrequent and the condition may become worse after such termination of pregnancy. We shall refer to a few of the salient points connected with some of the important infectious diseases that may occur in pregnancy. The general symptomatology diagnosis prognosis and the methods of treatment may be gleaned from text books on Medicine.

Among the common acute infectious diseases met with in pregnancy are influenza typhoid smallpox chicken pox scarlet fever measles and diphtheria. In most of these cases the sudden variations in temperature the severe toxæmia the associated damage to the heart and the kidneys and the tendency to hæmorrhage have all an adverse effect upon pregnancy.

Their effect upon the foetus is also deleterious. The part played by high ranges of the maternal temperature on the foetus has already been detailed. Intra uterine death of the foetus is not uncommon. The high toxic condition of the mother has also a very damaging effect upon the foetus. The premature interruption of pregnancy means almost certain foetal death. Foetal asphyxia may also occur *in utero* from various causes—from the low blood pressure from the profuse hæmorrhage that the mother may have and from degenerative changes. The child may also acquire the disease from the mother as the toxins may pass through the placental barrier and in some cases even the bacteria. Thus in cases like smallpox measles scarlatina typhoid etc. the infection has been noted in the foetus.

INFLUENZA

Perhaps one of the most serious of complications in pregnancy is influenza. This has been made evident in recent epidemics by the large toll of both maternal and infantile deaths associated with the severer forms of this disease particularly when it affects the respiratory tract. Owing to the high rise of temperature and the respiratory embarrassment that occurs when the lungs are involved abortion in the early months is very frequent. This is due to the death of the foetus because of the high degree of carbon dioxide accumulation and the lack of sufficient amount of oxygen. In the later months premature labour is not infrequent. The labour terminates quickly. This may be due to the increased force of uterine contractions brought about by the increased carbon dioxide content in the maternal blood stream.

A pregnant woman would appear to have an increased susceptibility to influenza and a higher mortality rate occurs in them than in other groups. In mild forms of influenza not much damage may be done to the mother or the offspring although in the majority of cases the mother is rendered so weak that if labour occurs soon after it increases the risks incidental to labour and puerperium. Susceptibility to puerperal sepsis is greater in those who have recently suffered from influenza particularly if the respiratory tract has been involved.

Prognosis So long as symptoms of influenza are mild there is no grave danger to the mother. In cases however where lung complications set in the mortality is very much greater. Increased tendency to abortion and premature labour has already been mentioned. The foetal mortality is very high on account of the prematurity and the toxic and asphyxiated condition of the mother. Even after birth the new born child is liable to influenza and the mortality is great.

Treatment The chief object to be kept in view is to prevent the possibility of infection. If influenza does develop care should be taken to see if possible that pneumonia does not set in. During an epidemic the expectant mother should be segregated and allowed to sleep separately with provision for plenty of fresh air. No one who has attended a case of influenza should attend her and she should avoid travelling in public conveyances or going where the spread of influenzal infection is likely such as crowded meeting places.

On the first signs of influenzal infection the patient should be put to bed immediately in a well ventilated room with plenty of fresh air. Besides the ordinary treatment adopted for the condition general stimulant treatment is desirable from the beginning. In lung complications such as pneumonia etc oxygen inhalations are beneficial. Cardiac stimulants may be necessary in the later stages. Oedema of the lungs sets in quite abruptly and requires prompt measures if any relief is to be afforded. Venesection may be necessary. Intravenous injections of strophanthin or some preparation of digitalis may be indicated for the cardiac embarrassment and failure. When a patient has had an attack of simple influenza she should be encouraged to take rest for seven to ten days after the temperature becomes normal. Light nutritious diet and careful nursing are required at this period. Neglect on the part of the mother may bring about a severe recurrence of the infection.

If the woman is in labour help may be given to relieve the strain of the second stage by the application of forceps under local infiltration anaesthesia. On the other hand in a large number of cases labour tends to be precipitate. It is inadvisable to induce labour in a woman suffering from influenza.

During the puerperium the patient should be particularly looked after as with the great amount of debility that results after an attack any slight exertion may end in a fatal attack of cardiac failure or embolism

TYPHOID

Prevalent everywhere it is much more so in the tropics owing to the deplorable hygienic conditions in the large majority of cities and rural areas. It is a serious complication of pregnancy and abortion or premature labour occurs in a large number of cases. In the later months of pregnancy the foetus may be born still or may die in the neonatal period. The disease gives rise to a slightly higher mortality in the pregnant than in the non gravid patients.

Not infrequently typhoid occurs during the puerperium when the differential diagnosis between puerperal sepsis and this condition may be a matter of difficulty. It is unfortunate that a large number of these cases are still confused and treated for ordinary puerperal infection when a careful examination of the patient and a correct observation of the pulse the gradual rise of the temperature the characteristic peculiar mental and physical condition of the patient the enlargement of the spleen and the nature of the stools would serve to differentiate the two conditions. The blood should always be examined for the Widal reaction and in many cases it is desirable to have a blood culture done. In rare cases puerperal sepsis may be caused by the typhoid bacillus.

The treatment should be conducted along the usual lines adopted for this condition. It is not desirable to terminate pregnancy under any circumstances. Prophylactic vaccination against typhoid may be done in the presence of an epidemic. In the puerperium it is advisable to remove the child from the mother and breast feeding by the mother is forbidden.

VARIOLA

This disease has got a very adverse effect upon pregnancy and generally causes abortion or premature labour. The severer forms of the disease like confluent smallpox and the hæmorrhagic varieties are particularly fatal in pregnant women. Should smallpox develop during the later months of pregnancy there are several possible terminations depending largely upon the severity of the attack. The infant may acquire the disease *in utero* and be born at term after the mother has recovered from the disease with only slight evidence of smallpox infection on the skin. On the other hand the child may be born with the eruptions fully developed or the rash may appear some days after birth. These terminations depend no doubt upon the stage of the disease at the time of

delivery It may generally be presumed that smallpox is transmitted from the pregnant mother to the foetus *in utero* But there are exceptions to this rule

The treatment of this disease in the gravid condition differs little from the treatment of smallpox at other times, except that all precautions should be taken to avoid premature labour, as labour at the time when the infection is active will be an additional strain

Occasionally when the child is born during the eruptive stage of the disease, the question arises as to what precautions should be taken to see that it does not develop smallpox Isolation is absolutely necessary, and it may be well to vaccinate the new born child in the hope that the vaccinia will take effect before the possible occurrence of smallpox and thus mitigate its severity

During an epidemic of smallpox in the community pregnant women ought certainly to be vaccinated It is possible that the protective influence of vaccination is also transmitted to the foetus On the other hand, it is most desirable if the mother has not been vaccinated to vaccinate the child soon after birth when an epidemic is prevalent in the locality Children are more likely to develop the disease than even the mothers and every step should be taken to protect the new born children by vaccination There is no contra indication to vaccinating them within the first week after birth

SCARLET FEVER

This disease is very rare in tropical countries Even in those countries where it is prevalent it is generally believed that pregnant women seldom get real scarlatina On the other hand, there seems to be good ground for the opinion that scarlet fever contracted during the puerperium, is serious Care must, however be taken to differentiate various scarlatinal forms of eruptions that may appear during the puerperium from the true scarlet fever

Rigid isolation is essential Care is also necessary to see that the streptococci from the nose or throat do not find their way to the genital tract In the puerperium energetic treatment is required

The question of giving an antitoxin should be considered with due reference to the possibilities of serum reaction

Treatment on the usual lines adopted for scarlet fever should be followed and the patient's general health supported

MEASLES

Measles not infrequently complicates pregnancy, and owing to the nature of the sudden elevation of temperature causes abortion or miscarriage or premature delivery

The prognosis in this condition is much more serious in the puerperium than during pregnancy. The general mortality is fairly high the reason being the occurrence of puerperal sepsis. Strict isolation is essential and every care should be taken to see that the discharges from the upper respiratory passages are not allowed to infect the genital tract.

DIPHTHERIA

This is a very rare complication of pregnancy or the puerperium. Cases have been reported in the literature of true diphtheritic infection of the genital tract. The disease should be treated along the usual lines adopted for diphtheria. Extreme prostration is not infrequent after delivery and supporting treatment is essential.

CHICKEN POX

This is not a rare complication of pregnancy particularly in the tropics. Usually however it does not cause any serious complications either in pregnancy or puerperium. Care must be taken to see that there is no error in diagnosis as occasionally the severer forms of chicken pox such as varicella gangrenosa or hæmorrhagica or bullosa may when first seen lead to errors in diagnosis. In these severer forms pregnancy is usually interrupted and the prognosis is much graver.

The differential diagnosis between smallpox and chicken pox is of primary importance. The day of the occurrence of the rash its distribution the nature of the temperature and the duration of the rash will help in coming to a diagnosis.

Absolute rest in bed light diet during the febrile stage and stimulant treatment later are indicated. Pregnancy should not be interrupted artificially.

RELAPSING FEVER

This is a specific infectious disease due to a spirochete and is prevalent in several parts of Europe and in India and in many other tropical countries. During an epidemic pregnant women are liable to contract the disease easily. In India the form that is most commonly noted resembles the relapsing fever of Europe but rigors are not so common collapse is more frequent at the crisis and relapses are more frequent. While relapses are common in some cases non relapsing forms may also occur. The disease may last from twelve to sixteen days and is associated with severe pain in the back and limbs headache nausea or vomiting loss of appetite a dry and coated tongue constipation is usual jaundice may occur in a fair percentage of cases and sometimes bronchitis and broncho pneumonia may also complicate the condition.

On microscopical examination of the blood spirochætes are usually present in large numbers during the febrile period. There is an increase of leucocytes particularly of the large mononuclear variety. The urine is scanty and may contain albumin granular or hyaline casts.

Diagnosis The characteristic temperature chart the nature of the outbreak and the occurrence of spirochetes in the blood help in the diagnosis. Dengue malaria and typhoid fever are the diseases most likely to give rise to errors in diagnosis but if a careful hæmatological examination be made diagnosis should not be difficult except in those rare cases where no spirochætes are present in the blood film even during the febrile stage of the disease.

Prognosis The mortality in different epidemics varies the average being 10 to 15 per cent. It is more fatal in pregnant women than in the non-gravid. In the majority of cases abortion or miscarriage or premature labour is the rule. When interruption of pregnancy occurs it usually happens either at the height of the fever or at the end of a crisis. The collapse is great and the prognosis is rendered all the graver. The prospects of recovery depend on the severity of the attack the general health of the patient and the promptness and nature of the treatment adopted.

Treatment—Preventive It is known that relapsing fever is due particularly in the Asiatic type to the louse which acts as a carrier and in the presence of epidemics the patient should be isolated and all contacts must be freed from lice. Where as in unhygienic surroundings with a great deal of overcrowding the women are not in a position to adopt proper methods of isolation or disinfection it is sometimes necessary to see that the hair is completely shaved off the head to avoid possibilities of the infected lice spreading from person to person. In other cases the hair should be cut short and a cloth soaked in kerosene oil or an equal quantity of kerosene and mustard oil should be applied close to the scalp to kill all the lice and their eggs.

Curative Complete rest in bed is essential during the attack and the convalescent stage. The great danger is heart failure and this is most likely to occur at the time of the crisis. The diet should be liquid light and nutritious.

The most useful specific treatment consists in the administration of one of the arsenical preparations—neosalvarsin novarsenobillon sulpharsenol etc.—being given preferably by the intramuscular route. The time to give the drug is soon after the onset of the fever or at the height of a pyrexia when the spirochætes are still numerous in the blood stream. The dose of the drug should be carefully regulated as pregnant women particularly in tropical countries do not stand the large doses usually recommended—a third to a half of the adult dosage being quite sufficient for this purpose.

Intra uterine death of the fœtus is not unlikely even in cases where pregnancy is not interrupted

For the complications such as bronchial catarrh hæmatemesis or hæmaturia suitable treatment should be adopted. The collapse stage should be carefully watched and stimulants like digitalis strychnine coramine camphor in-oil administered

Specific Diseases

SYPHILIS

This is one of the most important diseases affecting pregnancy which shows its effects not merely on the mother but also on the offspring and in some cases transmits its adverse effects even to the third generation. Syphilis is responsible for a large number of abortions miscarriages and still births. It is also responsible for a good percentage of neonatal mortality. The majority of macerated fœtuses are the result of syphilitic infection. It must however be stated that syphilis plays a much less important part in the causation of abortion. In fact repeated abortions occurring more or less at the same period of pregnancy are not generally due to syphilis.

Effect of Syphilis on Pregnancy The effect of this disease on pregnancy depends upon several factors. Among these may be mentioned —

(1) Time of infection—

- (a) Before pregnancy and the interval that has elapsed
- (b) At the time of conception
- (c) During the first half of pregnancy
- (d) During the last weeks of pregnancy

(2) Antisyphilitic treatment adopted—

- (a) Before conception
- (b) During pregnancy
- (c) The period at which such treatment was started during pregnancy

In general it may be stated that women who are syphilitic are sometimes sterile. If the infection occurred at a remote date and careful treatment was adopted there is no reason why the woman should not give birth to healthy children. In those cases where treatment has not been adopted the effect on pregnancy depends upon the period at which the infection took place. If the infection is recent the fœtus generally dies and abortion results but with each successive pregnancy the termination of pregnancy takes place at a later date so that a record may be obtained of abortion miscarriage premature birth of a macerated fœtus still birth at full term and a live birth of a fœtus showing later the stigmata of

syphilis, later still the children may be born apparently healthy and only show the manifestations of syphilis at varying periods after birth, in some cases after years. In such cases the manifestations are those of neuro syphilis.

If treatment be vigorously adopted at any stage this course of events may be terminated, and it is quite possible to ensure that the woman is delivered of a healthy child, or if treatment has been adopted somewhat late in pregnancy that she is delivered of a live child which, if properly treated may overcome the manifestations of the disease. Many deformities such as hydrocephalus anencephalus, spina bifida, etc. may be due to syphilis.

When the syphilitic infection occurs simultaneously with conception, the invariable rule is that abortion results. When however infection occurs during pregnancy the effect on the fetus will depend upon the period of gestation at which infection occurred. If it occurred in the early periods of pregnancy in the first trimester, or a little later, the possibilities are that the child may die and the woman be then delivered of a macerated fetus somewhere between the twenty eighth and thirty fourth week. On the other hand, if the infection were to take place in the last weeks of pregnancy the child may escape, but if care be not taken later it may be infected by the mother.

At one time it was thought that when conceptional syphilis took place the mother might herself escape but transmit the infection to the fetus. It is true that in some cases no stigmata of syphilis could be discovered in the mother and yet later the child was found to have definite evidence of syphilis. Such children, when suckled by the mother, did not infect the mother. Since the wide use of the Wassermann and Kahn tests it has now been realised that even in such cases the maternal blood gives a positive reaction so that it is not correct to say that the mother is free from the syphilitic infection. Why she should not develop the ordinary manifestations of syphilis is a matter for further investigation.

Effect of Pregnancy on Syphilis. In most cases it would appear that syphilis runs a mild course during pregnancy but some of the secondary manifestations such as condylomata and skin rashes may appear in an aggravated form probably because of the increased vascularity.

Treatment. The adverse effect of syphilis upon the fetus is so great that it is now an invariable rule in all antenatal clinics irrespective of any previous history or otherwise, to do the routine serological tests, Wassermann and Kahn in every case. It is surprising how in some cases with no evidence of syphilitic infection and no history these tests prove the presence of infection.

In every case where the diagnosis of syphilis is made, treatment

should be started immediately and must be done thoroughly. Pregnancy is no bar to the proper treatment of syphilis in the mother. On the other hand the possibilities of carrying pregnancy to full term are much greater if a thorough and radical method of treatment is adopted.

It is unnecessary to go into the details of the method of treatment to be adopted for syphilis as such details are found in treatises dealing with this particular condition.

The treatment should be persisted in till the Wassermann reaction is negative for at least one year. It is not sufficient to treat the mother as in a large number of cases the treatment might have been started at such a late stage that complete cure for the child cannot be guaranteed. The child may be apparently normal at birth but shows the manifestations of syphilis at a later stage. For this reason it is necessary that the child should also be treated. Simultaneously with the treatment of the mother, it is desirable that the other parent should also be subjected to treatment. Along with the usual measures such as injections of salvarsan bismuth etc. it is well to treat the patient for the accompanying anæmia. Iron and arsenic may be given in suitable doses. In view of the fact that the kidneys are always subject to damage during pregnancy from various causes the urine should be carefully examined from time to time and if there is any suggestion of damage suitable treatment should be adopted.

So far as the child is concerned it has already been stated that the mother can suckle the infant even though it may show manifestations of syphilis. A syphilitic infant stands in greater need of mother's milk than a healthy infant. On the other hand wet nursing should never be adopted as there is great danger of the infant infecting the nurse.

GONORRHOEA

Gonorrhœa is not infrequent in pregnant women the infection occurring either prior or subsequent to conception. Pregnancy would appear to favour exacerbation and extension of the infection. Gonorrhœa exerts a definite influence upon the pregnant woman and may cause abortion miscarriage premature labour and puerperal sepsis. In cases where the infection has been of some standing and the tubes are affected sterility may result. On the other hand if the tubes are not affected women with gonorrhœal infection frequently become pregnant. The cervix more than any other part of the genital tract is the site at which gonorrhœal infection persists longest. The primary site of infection in 90 per cent of the cases is either the cervix or the urethra. A vaginitis is very much rarer. Complications such as gonorrhœal arthritis gonorrhœal endocarditis and general peritonitis are noted

more often during pregnancy and the puerperium than in the non gravid condition. The chief period when gonorrhœa in a pregnant woman can show its most adverse effects is immediately after labour. At this time, because of the dilatation of the passages, the bruising of the tissues and the opening up of large venous spaces, the infection that has been limited to the cervical canal or the urethra or the ducts of the vulvo vaginal and urethral glands rapidly spreads to the uterine cavity, thereafter gaining admission through the tubes into the peritoneal cavity and thus a severe form of puerperal infection may result.

If the presence of gonorrhœa in pregnancy has been diagnosed every effort should be made to see that the condition is treated before delivery. Vaginal douches of weak solutions of potassium permanganate may be given twice a day, care being taken that the irrigations are given slowly and that no force is exerted. Vaginal suppositories containing a solution of 1 to 1.5 per cent of mercurochrome may be inserted daily or an ounce or two of the aqueous solution of mercurochrome may be instilled into the vaginal cavity. It is hazardous to attempt any intracervical examinations in an acute infection. The patient should be kept in bed, antiseptic hip baths given and diuretics and urinary sedatives administered.

Particular care must be taken in the conduct of labour. The parts should be shaved, the external genitalia thoroughly cleaned, the adjacent structures painted with a 5 per cent tincture iodine solution and the vagina swabbed with 1 per cent solution of mercurochrome. All vaginal examinations and the use of instruments should be avoided unless absolutely necessary. If the patient be in labour for a long time the vagina should once more be swabbed with an aqueous solution of mercurochrome. If operative delivery becomes absolutely essential a copious vaginal douche with a weak solution of potassium permanganate should be given without force and with the patient in the recumbent position with the head and trunk elevated just before the operation. It is most dangerous to attempt any intra uterine manipulation in women who have had gonorrhœal infection. The placenta should always be delivered by expression after the method of Credé.

During the puerperium firm retraction of the uterus and free drainage should be favoured. Immediate repair of lacerations is advisable. Postpartum douching or intracervical examinations are contra indicated and the patient had better be kept in Fowler's position for about ten days.

Occasionally, exacerbation of a latent infection of gonorrhœa occurs after labour, due to lacerations which result in the setting free of gonococci hitherto encapsuled in the glands and causes an elevation of temperature. The puerperium should be carefully watched for signs of any peritonitic infection.

Care of the Child Gonorrhœal conjunctivitis is the chief danger that threatens the infant the eyes being infected during the passage of the infant through the birth canal. To prevent the occurrence of ophthalmia neonatorum prophylactic treatment should be adopted. As soon as the head is born the eyes should be wiped with absorbent cotton moistened with boric acid solution 10 grains to 1 oz. This should be followed as quickly as possible by a thorough irrigation of the eyes with a similar solution after which 2 drops of a freshly prepared 1 per cent solution of silver nitrate should be instilled into each eye making sure that the solution falls into the eye and not upon the lids and that it is well distributed.

To prevent late infection in the puerperium the mother should be warned of the infectious nature of the discharge and the offspring should not be permitted to occupy the same bed as the infected mother. Should gonorrhœal ophthalmia develop it is better to place the infant under the care of a competent ophthalmologist. The eye should be carefully irrigated with a 10 per cent boric acid solution and silver nitrate solution 1 per cent instilled two or three times a day. The sound eye should be suitably protected.

GRANULOMA INGUINALE (INFECTIVE GRANULOMA)

This condition is widely prevalent in different parts of India and in several of the tropical countries and occurs sporadically more particularly in Madras and neighbouring districts. The disease commences in most cases on the genital usually on the labia minora or the groin in women and advances either by continuous eccentric peripheral extension or by auto infection of the opposing surfaces. Its extension is very slow and it gradually covers a large area.

The importance of this condition is due to the fact that it is not infrequently noted in women who are pregnant. The obvious risks involved in an ulcerating growth spreading over the labia and surrounding parts at the time of labour or even during the course of pregnancy make it necessary that early treatment should be adopted. This condition should be differentiated from malignant and syphilitic ulceration about the labia and groin which are not infrequent in pregnant women. It differs from these clinically histologically and therapeutically. The chief characteristics are —

- (1) Its extreme chronicity
- (2) Absence of any cachexia
- (3) Non implication of the lymphatic system
- (4) Failure of response to treatment with mercury or iodide of potassium or the usual anti syphilitic remedies

Unless there is a coincident syphilitic infection the Wassermann test is negative. Its characteristic mode of spread suffices to distinguish it from epithelioma. Biopsy will clinch the diagnosis.

Treatment. Modern treatment consists in intravenous injections of tartar emetic, which is a specific. A prolonged course of this drug is necessary—the total dosage being about 50 to 60 grains. Among the preparations that are now available in the market are Fouadin (from 0.5 to 5 c.c.) Ureastibamine and allied preparations. In pregnant women if the treatment is started sufficiently early the condition may heal before labour sets in. If however the ulcerating condition persists precautions have to be taken to see that infection does not spread into the genital tract at the time of labour. Vaginal examinations are therefore contra-indicated and as far as possible delivery should be left to natural efforts. It would at first appear safer to resort to delivery by the abdominal route where an ulcerating granulomatous condition of the genitals is present with the characteristic discharge. Our own experience of several cases has been that in spite of the theoretical considerations labour has ended naturally and no septic complications have ever arisen. In view of this experience we doubt whether it would be necessary at any time to resort to abdominal delivery unless there be indications which suggest the possibility of active interference being needed. In cases with extreme scarring consequent upon a healed ulcerative granuloma the narrowing of the vaginal outlet offers a serious impediment to the course of labour. In such cases it is necessary to resort to an abdominal route delivery as otherwise the lacerations and the delay in labour may seriously affect both mother and child adversely.

CHAPTER XIX

TROPICAL DISEASES

Malaria

THE widespread distribution of malaria especially in tropical countries makes it a not infrequent complication of pregnancy. The effect of malaria on pregnancy can be gauged from the fact that during an epidemic of malaria there is usually a sharp fall in the live birth rate as well as an increase in the infantile mortality rate. The fall in the live birth rate is due to the occurrence of abortion, premature labour and still births. Ordinary forms of malaria may not affect the course of pregnancy to the same extent as the more severe types but even in such cases the high range

of temperature with the associated rapid disintegration of the red cells does produce an effect on the course of pregnancy, particularly in the early weeks

The question whether the malarial parasite can pass through the placental barrier has been the subject of frequent discussion. The observations of Wickramasuriya in the recent epidemic in Ceylon reveal the fact that the foetus can sometimes contract malaria *in utero* and that transplacental infection with the malarial parasites does occasionally occur. Transplacental foetal infection is perhaps more frequent with the severer forms of the disease, such as the malignant tertian. It may spontaneously interrupt pregnancy before term. In mild attacks pregnancy may not be interfered with but a severe attack, and more particularly repeated attacks are liable to cause abortion, miscarriage or premature labour. Intra uterine death of the foetus may also occur in malaria. This may be due to the high range of temperature, which may also bring on miscarriage or premature labour. Another factor which has to be taken into consideration is the massive infection of the placenta with malarial parasites, which is to be seen in some cases of severe malarial infection. A possible though rare cause of intra uterine death is said to be the direct invasion of the foetus by the malarial parasites. A fourth factor to be borne in mind is the possibility of some degree of toxæmia following the malarial infection.

So far as the effect of malaria on labour is concerned, in many cases labour is not unduly prolonged and there is no special tendency for postpartum hæmorrhage. On the other hand, parturition is likely to be difficult in cases exhausted by a prolonged attack of malaria or during the convalescent period. In such cases primary or secondary uterine inertia is not infrequent, associated with some degree of postpartum hæmorrhage and even shock. In consequence thereof the maternal death rate is necessarily high.

Infant mortality within the first week of life is increased by malaria. The exhausted condition of the mother, the anæmia and the malnutrition, resulting from the malarial infection, tend to affect the foetus *in utero* and the child is born with lowered resistance, and in such cases death from any intercurrent disease is not infrequent.

The puerperium may also be complicated and the patient is liable to puerperal sepsis. Colitis, enteritis and other complications are common. Even though the patient may have recovered from the malaria, if labour begins before she has entirely regained her health the effect of malarial exhaustion is likely to be felt during the puerperium.

Another fact to be noted is that pregnancy by itself may cause

a relapse in latent infections, either during the later weeks of pregnancy or during parturition or the puerperium

So far as the prognosis in the different forms of malaria is concerned, the benign infection is less likely to interfere with pregnancy than the malignant. The malignant tertian types, on the other hand, are dangerous alike to the mother and child, and the prognosis should be guarded. The intensity of the paroxysms and the height of the fever, all other factors being equal, are points of bad prognostic significance.

Treatment—*Prophylactic* General measures for the improvement of the sanitation will no doubt be of great help in freeing any particular area from the possibilities of malarial infection. Tropical residents, particularly pregnant women, should cultivate the habit of sleeping under mosquito nets, and wherever possible live in mosquito proof houses. After sunset mosquito proof boots and the application of the oil of citronella to the wrists and neck is useful.

Curative Among the chief drugs which have been used in the treatment of this condition are quinine and certain of the synthetic products such as plasmoquin and atabrin. The patient should be confined to bed and the bowels moved by aperients. Quinine is still the most potent remedy we have. It is most effective in cases of benign tertian, less so in quartan and the malignant tertian. Of the many salts that are available the bihydrochloride of quinine is the most effective.

A mistaken impression is prevalent that quinine is contra-indicated in pregnancy. On the other hand, it may be definitely asserted that the danger lies in allowing a pregnant woman with malaria to go on without administration of adequate doses of quinine. The chief causes of interruption of pregnancy are the toxæmia of the malarial disease and the high range of temperature and not so much the use of quinine. We have had several cases where it has been clinically proved that quinine far from activating the gravid uterus has, when given under suitable conditions and with due precautions, actually prevented the interruption of pregnancy.

There are wide variations in the dosage recommended by various experts. Quinine may be given by mouth either in solution or in cachets. In the benign forms quinine bihydrochloride, 10 grains, given daily for a week, and then continued on alternate days for a further fortnight, and for two days in the week for a further period of three months, has in our experience proved quite satisfactory.

In the malignant tertian forms it may be necessary to give from 15 to 20 grains per day. It is rarely necessary to give the heroic doses that have been suggested. In certain cases the failure of quinine to act may be due to other causes. Unless the bowels

are properly emptied and the associated anæmia is also simultaneously treated quinine may not produce the same gratifying results. In some cases it is necessary to give quinine intramuscularly. The bihydrochloride is commonly used for this purpose—5 to 7 grains dissolved in about 2 to 5 c.c. of distilled water and sterilised may be given. Intravenous quinine injections are attended with great risk particularly in the pregnant woman and in the puerperium and we would definitely prohibit their use at these periods. In rare cases of cerebral malaria it may be necessary. In all cases where quinine is given it is advisable to administer sedatives simultaneously such as bromides in 15 to 20 grain doses.

Plasmoquin has been proved to destroy the malignant tertian gametocytes but has practically no effect on schizonts. It is given in tablet form combined with quinine $\frac{1}{2}$ grain of plasmoquin with 2 grains of quinine sulphate two tablets being given three times a day after food for six days. This is repeated after an interval of four days four or five courses being given. Toxic symptoms may sometimes appear such as headache nausea vomiting and bluish discoloration of the skin.

Atebrin is another of those synthetic products that have been used in recent years. It is given in doses of 2 to 3 grains daily over a period of four to five days. If a further course is necessary an interval of ten days should be allowed as the drug tends to accumulate in the body. Its action is on the schizonts and it appears to be at least as effective as quinine preventing relapses. Atebrin would appear to be contra-indicated in subjects of toxæmia of pregnancy pre-existing nephritis and advanced hookworm disease.

In addition to these drugs the general management of the patient requires some care. Suitable nourishing diet and tonics particularly hematemics should be given. The bowels should be kept fairly free and the patient should be kept under suitable hygienic surroundings and continuously watched till the termination of pregnancy.

Kala azar

This is by no means an uncommon complication in pregnant women in endemic areas. The disease itself is due to a protozoon the *Leishmania Donovani* present in the peripheral blood and the reticulo-endothelial system. It is most prevalent in Bengal Assam Madras and certain other cities of Southern India. It was a much dreaded complication before modern methods of therapy were available. Abortion is not infrequent and the mother may collapse after delivery. The disease itself may be confused with malaria and the patient may be unfortunately drugged with quinine for long periods. On the other hand a careful examination of the blood will reveal the leucopenia the characteristic changes in the

leucocytes and occasionally the presence of the *Leishmania Donovani* in the peripheral blood the enlargement of the spleen and the slight enlargement of the liver are also points to be noted

The cases may be mild moderate or fulminant Prognosis will naturally depend upon the nature of the onset the extent to which the corpuscles are destroyed and on the presence of complications such as jaundice grave anemia severe hiccough anuria hyperpyrexia broncho pneumonia and colitis

The diagnosis can be confirmed by the serum antimony test of Chopra or by the formaldehyde test The formaldehyde test is performed by adding one or two drops of commercial formalin to 1 c.c. of clear serum which is immediately shaken and left at room temperature When the reaction is positive the serum immediately becomes viscid and within one or two minutes assumes a whitish opalescent appearance and sets so that the tube can be inverted without spilling The therapeutic test would be equally effective both for diagnostic and curative purposes

Treatment Certain antimony compounds are specific and have robbed the disease of most of its terrors The trivalent antimony compound potassium and sodium antimony tartrate is given intravenously on an empty stomach in a 2 per cent solution beginning with an initial dose of $\frac{1}{2}$ grain in 15 c.c. of the solution and increasing by $\frac{1}{2}$ grain (15 c.c.) up to a maximum of 2 grains (6 c.c.) Only freshly prepared solutions sterilised by boiling should be employed The total quantity of the drug to be injected may vary from 40 to 60 grains The pentavalent antimony compounds have however recently come into vogue Stibamine neostibosan and ureastibamine are some of the preparations frequently employed

Simultaneously with the use of these injections the condition of the blood should be improved by suitable hæmatics Large doses of iron in combination with arsenic are beneficial Liver therapy may also be given nourishing diet plenty of fresh air and general hygienic measures should be employed

It is rarely necessary to terminate pregnancy in this condition If the case is taken in hand sufficiently early pregnancy may continue up to full term and the child be born without difficulty In untreated cases on the other hand a fatal outcome may result

Blackwater Fever

This disease is fortunately rare in pregnant women It is to be found only in some parts of tropical countries It is restricted to the Agency tracts and the Japur Hills in Southern India It is also present in parts of tropical Africa such as Uganda East Africa the Sudan and in the Southern States of the United States of America

It is an acute illness which occurs after an infection with the malignant tertian parasite and is characterised by severe hæmolytic hæmoglobinuric fever vomiting jaundice and anæmia. An acute condition such as this has obviously a very deleterious effect on pregnancy. Interruption of pregnancy is not infrequent and severe symptoms of toxæmia may be present. The onset is frequently sudden associated with a chill and pain in the back. Nausea bilious vomiting with jaundice and hæmoglobinuria occur in a short time.

Several different clinical varieties are met with such as the mild the fulminant and the uric cases. The prognosis depends upon the degree of hæmolytic hæmoglobinuria and as any severe degree of anæmia in pregnancy is associated with serious danger pregnancy renders the prognosis graver.

Treatment consists in treating the anæmia and the associated heart failure relieving the toxæmia and preventing suppression of urine. Careful nursing is essential. The diet should consist of bland fluids like barley water fruit juice glucose. Later milk may be given or Benger's Food may be allowed. Proteins should be restricted for a considerable time on account of the involvement of the kidneys. Blood transfusion intravenous glucose and alkalinisation of the urine should be attempted. The bowels should be kept fairly open by saline purgatives.

Quinine should under no circumstances be given in this condition. Atebrin or plasmoquin may have to be given for the associated malarial infection if parasites are found persisting in the blood after two or three days from the onset.

Cholera

Cholera exists endemically in many of the Eastern countries and especially in India and at times occurs in an epidemic form. Not infrequently therefore the pregnant woman is affected. The disease itself is caused by the *Comma vibrio* and is characterised clinically by severe vomiting copious rice water stools dehydration cramps and suppression of urine. The specific micro organisms are generally found in greatest numbers in the lumen of the small intestine and less so in the gall bladder. In an acute condition such as this it is obvious that pregnancy will be very adversely affected and that the prognosis for the pregnant woman will be much worse than for the non gravid.

Three more or less well-defined stages may be noted in the course of the disease. The preliminary diarrhoea when the patient has colicky abdominal pain looseness of bowels headache vomiting and mental depression. Later the stage of collapse sets in all fecal matter rapidly disappears copious colourless rice water

stools containing flakes of epithelium are passed. Watery vomiting may also occur. During this stage cramps starting in the hands and feet appear. Thirst, restlessness and collapse become extreme, the skin is cold, blue and wrinkled. The face is drawn and pinched presenting the typical Hippocratic facies. The temperature may be subnormal, the blood pressure markedly low and the pulse almost imperceptible. The output of urine is diminished and it contains albumin and casts. Symptoms of uræmia may set in with suppression of urine. In the third stage which is the period of reaction in favourable cases, there is recovery. The temperature rises to normal, the heart's action and blood pressure improve.

In this condition cardiac failure is not uncommon. Abortion and premature delivery are not infrequent. Even when the pregnant woman has been fortunate enough to overcome the chances of interruption of pregnancy in the stage of collapse abortion or miscarriage may occur in the period of reaction because of the elevated temperature. The prognosis may therefore be said to be very grave, both because of the innate risks of such an acute condition and because of the added risks of pregnancy.

Treatment There is no other acute infectious disease in which the early institution of treatment is so urgent.

Prophylactic During an epidemic, cholera vaccine is valuable affording temporary immunity. Particular care should be taken with all foodstuffs. Houses should be fly proof and foodstuffs and drinks protected from flies. It is best to take hot foodstuffs and to boil everything that is to be taken as food or drink.

Curative The essential treatment consists in replacing the fluids and salts lost from the blood by intravenous injections of hypertonic saline solution. The specific gravity of the blood should be noted and two solutions have to be used. (1) hypertonic saline for reinforcing the blood volume and chloride loss and (2) an alkaline solution to counteract acidosis and uræmia.

The hypertonic solution consists of—

Sodium chloride	120 grains
Potassium chloride	6
Calcium chloride	6
Water	1 pint

The alkaline solution consists of—

Sodium bicarbonate	160 grains
Sodium chloride	90
Water	1 pint

The salts are sold in the shape of tablets and can be readily obtained for this purpose.

During the stage of collapse one pint of the alkaline solution is given, supplemented with the hypertonic solution to the extent indicated by the specific gravity of the blood. If the specific

gravity is above 1060 the amount of hypertonic solution will depend upon the excess over this figure of the specific gravity. That is, if the specific gravity is 1062 or 1063, 2 or 3 pints of the hypertonic solution will have to be given. Care must be taken to watch for the rise in temperature after the hypertonic saline, and any tendency for hyperpyrexia should be combated.

Threatening uræmia is treated by poultices to the loins, dry cupping, alkaline solution per rectum and by injections of 5 to 10 per cent glucose. Drug therapy by mouth is almost entirely limited to the use of potassium permanganate and kaolin; potassium permanganate can be given in 2-grain pills or in solution, and kaolin, 1 to 3 drachms in water, may be given every half hour. Hypodermic injections of atropine sulphate, $\frac{1}{16}$ grain, morning and evening, are also useful.

The diet in this disease is to be given with great caution and should be entirely liquid. Till reaction has set in no nourishment is necessary. When tolerated, glucose, barley-water and rice-water may be given, and as the patient improves farinaceous food is allowed, but proteins and extractives must be withheld until the kidneys have begun to function normally.

It is inadvisable to terminate pregnancy in this condition. When, however, abortion or miscarriage is inevitable, help along conservative lines without the administration of an anæsthetic may be needed.

Filariasis

This disease may sometimes affect the pregnant woman, and as it is prevalent in many parts of India it is not infrequent to see some of the manifestations of filarial infection in association with pregnancy. The commonest is *elephantoid growth* of the vulva, which may be extensive enough to produce mechanical obstruction during labour to the passage of the foetus. Another effect of filariasis is *chyluria* in pregnancy. The occurrence of filarial fever itself may occasionally interfere with pregnancy.

In cases where elephantiasis of the vulva is present, the mode of delivery should be decided beforehand. In most cases where the growth is at all considerable, the safest course is to resort to delivery by the abdominal route. It is not desirable forcibly to deliver the foetus through the vagina in the presence of elephantiasis of the labia, as invariably extensive lacerations occur which cannot be sutured and which later may tend to slough. The dangers of puerperal infection are thus considerably increased. Occasionally in the presence of elephantoid growths of the vulva, prolonged labour occurs resulting in rupture of the uterus if the patient is not under medical care. In such cases it would appear desirable to perform a Cesarean hysterectomy.

Removal of the growth during pregnancy is not desirable as the bleeding is severe and may cause interruption of pregnancy. If the parts slough as they often do after removal the chances of puerperal infection are great should the woman abort or have a premature delivery.

Chyluria is sometimes a troublesome complication in pregnancy. The condition may occasionally necessitate interruption of pregnancy. The treatment of this condition leaves much to be desired.

In cases of elephantiasis of the vulva the patient should be advised to have the growth removed at a suitable interval after delivery.

Beri-beri

This is a deficiency disease due to lack of vitamin B₁ and occurs frequently in tropical countries where rice is the staple article of dietary among the population. It is fairly widespread in parts of India, Japan, Malaya, East Indies and the Philippine Islands. The disease may occur in pregnant women and in women in the puerperium or the lactating period.

Its importance in pregnant women is due to the fact that if certain types of the disease occur such as those with the cardiac manifestations prominent or the wet type of beri beri the prognosis is much graver.

The differential diagnosis of this condition is necessary for proper lines of treatment to be adopted. In the wet form of beri beri the disease should not be confused with conditions during pregnancy which produce varying grades of œdema or with the toxæmia of pregnancy. The paræsthesia and heaviness of the limbs, the absence of the knee jerks, the tenderness of the calf muscles and the general weakness of the patient together with shortness of breath, dyspnoea, tachycardia suggest the possibilities. The heart may be found dilated, particularly the right side, with systolic murmurs and embryocardia. Examination of the urine, however, reveals the fact that it is free from albumin and casts. In the acute cardiac type the cardiac symptoms may predominate from the onset and signs of decompensation may appear with precardial pain, epigastric distress, tachycardia, evidence of congestion of the lungs and tenderness over the liver with subcutaneous œdema and serous effusions. At any stage in the course of the disease interruption of pregnancy may occur. The disease is very fatal and death occurs within a few hours or a few days.

The treatment consists in prophylactic measures being adopted in cases of pregnant women in the particular endemic area. A balanced diet may be provided with adequate vitamins, particularly B₁. This can be given in the shape of foods rich in B₁ such as

eggs mull liver yeast etc In institutions where polished rice or white bread is the main article of dietary under milled or hand pounded rice and whole wheat flour should be substituted and tinned provisions avoided

When the disease manifests itself during pregnancy the woman should be put to bed and complete rest ordered The condition of the heart should be carefully noted and if any signs of decompensation manifest themselves cardiac stimulants are indicated At first only small feeds should be given containing Marmite and later a dry low carbohydrate diet rich in vitamins should be allowed

Infantile Beri-beri

This disease is responsible for a heavy incidence of infantile mortality In the case of infants whose mothers are affected with latent or clinical beri beri the disease may occur both in an acute and chronic form In the chronic form gastro intestinal symptoms are present such as anorexia vomiting diarrhoea or constipation associated with wasting slight fever pallor oedema and dyspnoea Later other evidences of cardiac insufficiency may manifest themselves In the acute form death may occur with great rapidity the infant suffering from severe pain and presenting symptoms of cyanosis and dyspnoea In all cases where there is a suspicion of latent or clinical beri beri in the mother breast feeding should be withheld the child should be put on artificial feeds or a healthy wet nurse if available should be employed for this purpose Extracts of rice polishings have the reputation of being wonderfully efficacious in this condition

Leprosy

The scourge of leprosy is so widely prevalent in all tropical countries that cases occur where pregnancy is complicated by this condition This is a disease produced by a specific bacterium and characterised by lesions of the skin nerves and viscera eventually resulting in anæsthetic patches ulceration and a great variety of trophic lesions

It is unnecessary to go into details with regard to the causation of this condition Its importance with regard to pregnancy lies in the fact that when the disease develops in pregnant women there may occasionally be an exacerbation of the condition The effect on the foetus has also to be taken note of It is impossible in many cases to adopt adequate prophylactic measures much as they are desirable in tropical countries The lack of proper organisation the financial difficulties and the inadequacy of accommodation and proper facilities for the care of lepers make the problem so complicated and difficult that at present it may be said that in every

large city and even in the rural areas there is promiscuous mixing of lepers with the healthy population. The pregnant woman should be isolated and carefully looked after. Besides the usual treatment that is adopted for the leprotic condition, care should be taken to see that proper diet and hygienic surroundings are available. Our own experience of pregnancy in leprotic women is that the foetus generally goes on to term and is born in a healthy condition. It is rarely that interference has been necessitated and where such interference was required it was to help the woman with forceps or extraction.

During the puerperium there is a risk of puerperal sepsis. Particularly in the nodular and ulcerating types of leprosy care should be taken to see that all precautions possible are taken in the course of the delivery and that none of the patient's soiled linen comes into contact with the pads used to cover the genitalia.

A question of importance is the care of the child after delivery. The child should at once be removed from the diseased parent and must be carefully looked after preferably in an isolated room. If so treated the child may escape the possibility of leprotic infection. It is a moot question whether leprosy can be directly transmitted to the foetus *in utero*, but the possibility of the infection is very great because of the intimate association between the mother and child if the child is left to the care of the mother.

A problem that arises in this condition is whether a leper should be allowed to marry. Obviously no leper should be allowed to marry a person who is of sound health. Should a leper be allowed to marry another leper? In the present state of our knowledge from the hygienic and eugenic points of view it would appear to be a risky experiment to allow offspring from leprotic parents. As, however, this question may be decided without any reference to medical opinion the only alternative is to warn the parents about the possibility of infecting the child after delivery and to suggest to them that the child should be segregated and specially cared for.

Helminthiasis

HOOKWORM DISEASE

Hookworm disease or ankylostomiasis is very common in tropical and subtropical countries and is one of the most common causes of chronic invalidism, of mental and physical inertness and not infrequently of death. Its greatest danger appears to be when it occurs as a complication of pregnancy. The disease is due to the worms attaching themselves firmly to the mucosa of the

duodenum and the small intestine feeding on blood and causing local bleeding. Toxins are also probably secreted by the parasites which depress the erythroblastic activity of the bone marrow. There are two common forms of the hookworm—the *Ankylostoma duodenale* and the *Necator americanus*. The two species differ in so far as their buccal armature is concerned. The capsule is smaller in *Necator americanus* and has an irregular border instead of the four ventral hook-like teeth of the *Ankylostoma duodenale*. There is also a pair of semilunar plates in the *Necator*.

When the infection has taken place and particularly if it is heavy symptoms may appear within one or two months. These are largely related to the anemia which is of the secondary type, associated with a low colour index and an increased blood volume. The red cells may have diminished to one to two and a half millions and the hæmoglobin may vary from 10 to 25 per cent. Mild cases may be symptomless but in the moderately severe cases mental and physical lethargy, hyperacidity, epigastric tenderness, palpitation and shortness of breath are present. In the more severe type there may be a discoloration of the skin which is dry and muddy in colour. Pallor of the mucous membranes is particularly marked. The pale flabby tongue combined with the general puffy appearance of the face and its muddy complexion give a striking picture of this condition. The veins of the neck may be pulsating and hæmic murmurs are common. Retinal hæmorrhages, cedema of the feet and serous effusions may also occur.

Diagnosis. The disease can be easily diagnosed by the characteristic clinical picture and confirmed by the examination of the stools which will show the typical ova especially if the flotation method is adopted.

Influence of Hookworm Disease on Pregnancy, Labour and Puerperium. This disease has a very adverse effect upon pregnancy. Spontaneous interruption of pregnancy is not infrequent, abortion, miscarriage, premature birth and still births being common occurrences especially in the neglected or untreated cases. Associated with this condition there is marked albuminuria and anasarca particularly in the last trimester of pregnancy. These are secondary and not symptoms of essential toxæmia. Intra-uterine death of the fœtus before term is not infrequent. It depends upon the severity of the infection and the degree of anemia. Premature labour occurs often and accordingly the child is small and the labour may be precipitate.

During the puerperium owing to the low vitality of the patient the incidence of puerperal sepsis is greater. Diarrhœa, dysentery, pyelitis, etc. are not uncommon complications.

Prognosis. In general the prognosis is unfavourable both to the mother and the child when hookworm disease complicates pregnancy.

This is due to the anæmia and to the tendency for cardiac failure. In the severe types of anæmia the same adverse effects may follow labour as do in pernicious anæmia of pregnancy. The time immediately after labour is the most serious. Sudden death after delivery is not infrequent. The longer the patient has been under treatment and the greater the improvement in her general condition the better are the chances of her survival.

If the patient survives the shock of labour she has to be particularly watched during the puerperium. The risks of cardiac failure, respiratory embarrassment and puerperal sepsis are by no means small.

The prognosis for the child is also unfavourable. The tendency for premature delivery and the greater incidence of convulsions make the prognosis more unfavourable for the child.

Treatment. From what has been stated above it will be realised that hookworm infection is a serious complication in pregnancy. In all areas where ankylostomiasis is prevalent care should be taken to examine all pregnant women in the early months of pregnancy and to adopt the anti hook worm treatment if necessary. The need for mass treatment in cases of hookworm infection in communities need hardly be emphasised. A routine hæmatological examination at the antenatal clinic of all pregnant women at any stage of pregnancy has already been emphasised.

When the anæmia has been definitely diagnosed as due to hook worm the particular treatment needed should be started at once. Pregnancy is no contraindication. On the other hand it is a positive indication for early and speedy treatment. The fear that abortion or miscarriage will follow as a result of the treatment is absolutely groundless although it must be realised that care is necessary to avoid too drastic methods.

One of the essential precautions in the management of the condition is carefully to examine the heart and the circulatory system.

The proper method of treatment for this condition is the use of anthelmintics of repute. The best among these are oleum chenopodium, carbon tetrachloride, beta naphthol and thymol. The combination of carbon tetrachloride with oil of chenopodium is very effective. In some cases the administration of calcium and glucose may form an integral part of the preliminary preparation. Glucose should be given in drachm doses in water several times a day for a number of days before and after treatment. Calcium may be administered orally in the form of calcium lactate or colloidal calcium but when there is difficulty in absorption owing to the condition of the gastro intestinal tract calcium gluconate 10 c.c. of a 10 per cent solution or colloidal calcium 1 c.c. may be given intramuscularly.

After this preliminary treatment the anthelmintic is administered on an empty stomach first thing in the morning. It is important to realise that the dosage of the anthelmintic as well as the essential purgative should be much less in the case of a pregnant woman than in the case of the ordinary adult. It is not desirable to give the large purgative advocated for such cases owing to the possibility of inducing labour. On the other hand, a certain amount of purgation is very necessary, so that the ova and the worms may be cleared out of the intestines. The maximum dose of carbon tetrachloride or tetrachlor ethylene must not exceed 30 minims, while oleum chenopodium should be given in doses not exceeding 10 minims. It is well to give any of these drugs, using a saturated solution of magnesium sulphate as the vehicle. A commonly prescribed draught is as follows —

Oleum chenopodium	10 minims
Carbon tetrachloride	20 "
Saturated solution of magnesium sulphate	1 to 1½ oz

In some cases thymol may be administered in doses of 10 grains at intervals of one or two hours, say at 6, 8 and 10 A.M., not more than three doses being administered, followed by magnesium sulphate an ounce at noon. Occasionally it is desirable to alternate the anthelmintics, which may be given at intervals of a week or ten days, thymol treatment being followed by that with oleum chenopodium, or the combination of oleum chenopodium and carbon tetrachloride.

The use of the anthelmintics may be attended with symptoms of poisoning in some cases. Thymol solvents, including alcohol, fats such as butter and milk, castor-oil, ether, glycerine and chloroform should be avoided for at least forty-eight hours, as they may lead to excessive absorption of the drug.

Carbon tetrachloride may cause symptoms of poisoning in twenty four to forty-eight hours, such as pain in the abdomen, vomiting of bile coloured fluid, headache, rise in temperature and tenderness in the hepatic and epigastric regions, with enlargement of the liver, jaundice and sometimes convulsions. Should these symptoms appear intensive, treatment with calcium and glucose should be instituted. The bowels must be promptly moved. This anthelmintic should not be used when there is fever or hepatic, renal, pulmonary or heart disease or calcium deficiency.

With chenopodium, symptoms of poisoning may appear in two or three hours or may be delayed for as long as thirty six hours. The early symptoms are headache, dizziness, deafness, tingling of the fingers and sometimes drowsiness. In fatal cases convulsions and coma may precede death. When warning symptoms

of poisoning develop it is essential that immediate evacuation of the bowels should be obtained by copious and repeated enemata and if possible by repetition of the purgative by mouth.

When any of these anthelmintics are used the stools should be examined and the number of worms counted. Seven to ten days later the stools should be examined again and if ova have reappeared then another course preferably with a different anthelmintic is advisable.

When carbon tetrachloride or chenopodium or tetrachlor ethylene is used it is not desirable to repeat the treatment within a fortnight as time should be given for the recovery of any hepatic damage which may have resulted from the previous treatment.

With the elimination of the hookworms and their ova considerable improvement occurs in the general health of the patient and the haemoglobin percentage can be seen to rise rapidly.

To effect prompt improvement it is necessary that the anemia should be actively treated. For this purpose iron is necessary. Ferric ammonium citras, pulvis ferri or ferrous carbonate are preparations commonly used. Liver therapy is beneficial. Vitamin therapy is also of great value. Marmite adexolin preparations of cod liver oil are all helpful at this stage. The diet should be light and nutritious and if there is albumin in the urine it is perhaps desirable to restrict the patient to a salt free diet.

Management of Labour and Puerperium. The general principles guiding the management of labour in cases of pernicious anemia of pregnancy hold good in all severe types of anemia. It is most undesirable to induce labour in an anemic woman. The first step to be taken is to improve the condition of anemia and get rid of the factors responsible for it. At the same time when the woman is in labour the second stage should be expedited to save the strain upon the already damaged heart.

After labour it may be necessary to give cardiac stimulants inhalations of oxygen glucose by mouth or intravenously.

The puerperium should be carefully managed to avoid any danger of sepsis or intercurrent disease such as diarrhoea dysentery etc. After the puerperium the patient should again be examined to ascertain her exact condition and the possibility of hook worm infection still lurking. Periodic examination of the patient's stools should be advised and prompt treatment adopted whenever necessary.

CHAPTER XX

DISEASES OF THE BLOOD

Anæmias

THE hæmopoietic system plays a dominant role in the causation of certain complications during pregnancy. With the growth of the fœtus although the hæmopoietic apparatus of the fœtus is distinct from that of the mother the necessary oxygen and nutrition for both have to be supplied through the maternal system. An unusual burden is therefore placed upon the blood forming mechanism of the mother during pregnancy. In some cases the maternal system does not respond to this heavy strain and consequently while the fœtus gets its oxygen and nutrition in the

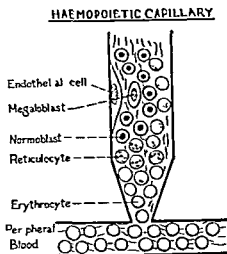


FIG. 60.—The maturation of the red blood cells.

majority of cases this is done at the expense of the maternal system. If added to the normal increased strain on the hæmopoietic system there should be other conditions likely to interfere with the physiological reaction of the system by causing either a diminished production or an increased loss of some or other of the contents of the blood. It is obvious that a severe degree of anemia must necessarily result. This complication is more likely to occur in the tropics owing to the large number of tropical diseases which have an adverse effect upon the blood and also owing to the greater prevalence of nutritional deficiency.

In a healthy pregnant woman the total quantity of blood is reduced especially in the later months and the blood forming

organs ordinarily show marked activity. The spleen enlarges, the bone marrow is active and the lymph glands all over the body are frequently enlarged. In cases however where the pregnant woman suffers from certain diseases or is the subject of nutritional defects, anæmia may develop easily. It is quite common in the tropics to see a large majority of women particularly during the last trimester of pregnancy showing some degree of anæmia. This condition is so prevalent that it should be a rule in all antenatal clinics to make a thorough hæmatological examination in every case. This should form one of the main features of antenatal work in the tropics.

METHODS OF HÆMATOLOGICAL EXAMINATION

For a clear conception of the degree of anæmia and the particular variety of anæmia from which the pregnant woman is suffering the following procedure should be carried out.

After a systematic examination of the case investigations should be made in the following directions —

(1) Hemoglobin estimation. This can be done by any of the well known hæmoglobinometers, one of the common instruments giving a reasonably accurate reading being the new model improved Dares hæmoglobinometer.

(2) White cell count. An estimation of the white blood corpuscles together with a differential count should always be made.

(3) Red cell count. The total number of red cells per cubic millimetre should also be taken.

(4) Reticulocyte count. Reticulated R B C's are young R B C's in which can be demonstrated a fine reticulum by means of a special stain. Their importance is due to two factors: they are of the greatest value in the diagnosis of the severer forms of anæmia, and from the standpoint of treatment one may often judge of the efficacy of a certain type of treatment by the reticulocyte response. In pernicious anæmia, for instance, three to seven days after treatment with liver therapy there is a sharp increase in the reticulocytes.

To demonstrate the reticulocytes the blood film is stained with a saturated alcoholic solution of brilliant cresyl blue and after drying counterstained with Leishman's stain. The reticulocytes are easily made out and their proportion can be noted by noting their number in a count of a thousand R B C's.

(5) Measurement of the mean diameter of the red cells. This is done by one of two methods: the Price-Jones method or the diffraction method.

In the Price-Jones method the size of the red cells is noted and an average taken and plotted on a graph. A shift of the peak to the right is characteristic of all macrocytic anæmias, but the

combination of this factor together with a marked broadening of the base of the curve is seen at its greatest in primary pernicious anemia. On the other hand in most secondary anemias and in simple achlorhydric anemia the peak is shifted to the left.

(6) Examination of the stained blood film. This is very essential not merely to get a general picture of the blood but also to note the presence of any abnormalities such as parasites of malaria kala-azar etc.

(7) Van den Bergh's test. This test enables us to distinguish hemolytic from obstructive jaundice and by the icteric index to

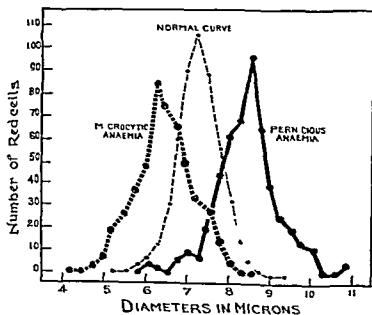


FIG. 61.—Price-Jones curve in cases of anemia.

assess the condition quantitatively. The reaction when positive may be either direct or indirect or biphasic.

(8) Test meal. In the severe types of anemia it is always desirable to examine the gastric contents after a test meal. This gives an indication among other things as to whether the anemia is associated with either an absence or diminution of free hydrochloric acid in the gastric juice.

(9) Examination of the urine. This is done as a matter of routine and should furnish information as to the presence of bile urobilin, blood, albumin and casts in the urine.

(10) Examination of the feces. It is very necessary to examine this for the presence of occult blood and any ova or parasites. The frequency with which severe forms of anemia are associated with intestinal parasites particularly in the tropics should be borne in

mind The presence in particular of hookworm infection or a heavy infection with round worms or the different varieties of tapeworms makes the examination of the feces a necessary routine

Among the other tests which may be done are a blood platelet estimation, the fragility test, the Arneth count and the blood sedimentation test

The fragility test is the estimation of the resistance of the erythrocytes to varying strengths of sodium chloride solution Thus is of great importance in jaundice as it will help to differentiate the hæmolytic type of jaundice from the non hæmolytic

The blood sedimentation test depends upon non specific reactions occurring as the result of tissue destruction, change, or inflammation in the body

While it may not be necessary to go through all the different tests enumerated above in every case, the estimation of the corpuscular content and hæmoglobin would enable one, in the first instance, to decide whether the patient is definitely anæmic or otherwise, and where a case has been diagnosed as one of anæmia it is necessary to go through the majority of these routine tests

ANÆMIA AND PREGNANCY

It is not possible to give an exhaustive classification of the different types of anæmia, nor is it necessary for our purpose The common forms of anæmia met with in the pregnant woman may be classified under the following heads —

(1) Nutritional deficiency anæmias—

(a) Primary macrocytic hyperchromic anæmia, that is pernicious or Addisonian anæmia

(b) Secondary macrocytic hyperchromic anæmia some times spoken of as Pernicious anæmia of Pregnancy

(c) Secondary microcytic hypochromic anæmia

(2) Post hæmorrhagic anæmia, which may be either acute or chronic resulting from the loss of blood from the gastro intestinal urogenital or respiratory tracts

(3) Hæmolytic anæmia a form of secondary anæmia which may result from several causes, such as malaria kala azar septic infections, poisons such as arsenic lead, phosphorus, intestinal parasites, particularly ankylostomiasis

(4) Physiological anæmia of pregnancy

(5) Other forms of anæmia, such as aplastic types, may also occur in pregnancy

A classification which has been in vogue for some time, but which is gradually losing its significance, is to divide the anæmias

into primary and secondary. We now realise that even the so-called primary anæmia is due to causes which are perhaps not yet quite clearly realised. The secondary anæmias are due to factors which are definitely known and which cause anæmia as a secondary symptom.

A method of classification is to divide the anæmias according to the colour index. Thus the anæmia is said to be hyperchromic if the colour index is high, orthochromic if the colour index is normal and hypochromic if it is low.

Another classification is according to the size of the red cell. An anæmia is said to be macrocytic if a large number of megalocytes are present, that is, anæmia characterised by an increase in the size of the red blood corpuscles. It is normocytic if the red cells are normal in size and microcytic if the majority of the red cells are diminished in size.

Combining the two we may therefore have—

A macrocytic hyperchromic orthochromic or hypochromic anæmia and

A microcytic hyperchromic orthochromic or hypochromic anæmia.

Usually however the two well-defined types are —

(1) Macrocytic hyperchromic anæmia and

(2) Microcytic hypochromic anæmia.

The secondary anæmias are generally microcytic and hypochromic although in some of the very severe types such as that due to the *Dibothriocephalus latus* or the pernicious anæmia of pregnancy one may have a hyperchromic form of anæmia associated with megalocytes or microcytes.

Primary macrocytic hyperchromic anæmia or pernicious anæmia or Addisonian anæmia is characterised by a megalocytic anæmia, achylia and a tendency to degeneration of the spinal cord and pursues a remittent course which is invariably fatal unless appropriately treated. Fortunately this disease is very rare in pregnant women but it has a close resemblance to the pernicious anæmia of pregnancy dealt with below.

PERNICIOUS ANÆMIA OF PREGNANCY

This condition is very common particularly in tropical and subtropical countries and it is now recognised that the anæmia is a form of tropical nutritional anæmia. In the more severe form of the disease the characteristic features are a destruction of the red cell, a high colour index and a megalocytic blood picture. It may recur in successive pregnancies and is attended with grave risks to

the life of the individual, particularly at the time of labour. Before modern methods of treatment were available the disease was responsible for a heavy mortality among pregnant women and quite 40 to 50 per cent of the cases invariably ended fatally. The disease appears to be more frequent in multipara than primipara and has a very insidious onset. The patient hardly realises the gravity of the condition till there is general œdema, attacks of dyspnoea and extreme weakness. An examination of the blood shows marked reduction in the red cells and great alteration in the

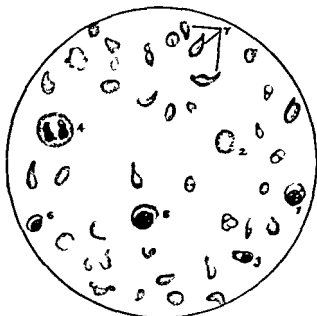


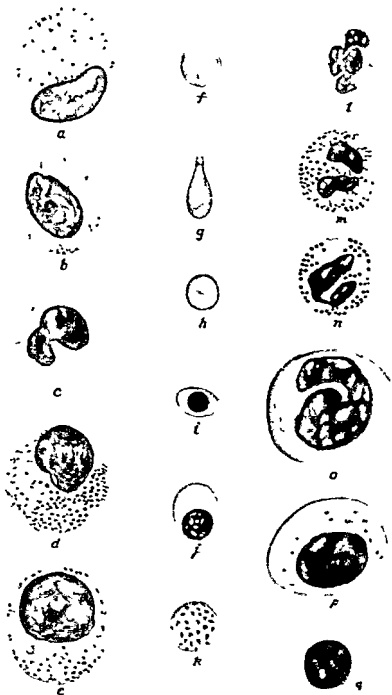
FIG. 67.—Blood picture in a severe case of pernicious anemia

- | | |
|--|---------------------------------|
| 1 — Megaloblasts | 5 6 — Normoblasts |
| 2 — Poikilocytic granular degeneration | 4 — Leucocyte normal Polkocytes |

shape variations in size and the presence of nucleated red cells being very common. The colour index may be high.

This type of anemia differs from the Addisonian type in some respects. The free hydrochloric acid content of the gastric juice may be perfectly normal or may be slightly diminished but achlorhydria or achylia gastrica is not present. Secondly, there is rarely any tendency to subacute combined degeneration of the spinal cord. Thirdly, while the indirect Van den Bergh test is positive in both, from the point of view of quantitative estimation it is much less in pernicious anemia of pregnancy (0.5 to 1.5 units) than in the Addisonian type (0.75 to 1 units).

Physical Signs and Symptoms. The disease makes itself evident between the twentieth and twenty-eighth weeks of



Cells in bone-marrow

Normal and abnormal red cells.

Normal leucocytes.

FIG. 63.—Blood cells, normal and abnormal.

- (a) Neutrophil myelocyte (large).
 (b) Neutrophil myelocyte (small).
 (c) Transitional neutrophil.
 (d) Eosinophil myelocyte.
 (e) Basophil myelocyte.

- (f) Normal red cell.
 (g) Poikilocyte.
 (h) Polychromatophilic cell.
 (i) Normoblast.
 (j) Megaloblast.
 (k) Granular degeneration.

- (l) Polymorphonuclear neutrophil.
 (m) Eosinophil.
 (n) Mast cell.
 (o) Large lymphocyte.
 (p) Large lymphocyte.
 (q) Small lymphocyte.

pregnancy The patient is noticeably weak dyspnoeic and presents a fairly lemon yellow colour suggestive of Addisonian anæmia The face is puffy and there is œdema of the feet with varying amounts of albumin in the urine The tongue is sore in some cases The heart is enlarged slightly and hæmic murmurs are present the heart sounds are not rapid except in the late stages and if rapid it is within the limits of the degree of anæmia The blood pressure is normal but may sometimes be subnormal Riles may be heard over the lungs and there may be effusion in the severer form of anæmia Ascites is also common in such cases Hæmorrhages into the retina may be seen in some of the cases The liver and spleen are not notably enlarged The patient complains of extreme weakness breathlessness on slight exertion and occasional attacks of palpitation The appetite is poor and the urine may be passed in small quantities Occasional attacks of giddiness and fainting may occur

The disease takes a progressive course until death supervenes or in some cases spontaneous improvement occurs in the puerperium Labour generally sets in prematurely and is precipitate The patient's condition becomes much worse immediately after parturition In fact this period seems to be the most critical as with the birth of the child the breathing becomes more laboured hyperpnœa and dyspnœa develop the patient becomes comatose and although the heart may continue to beat the respirations become more shallow and sighing till the patient expires

If the patient survives the shock of labour the prognosis is slightly better but the first few days of the puerperium are still critical days and the slightest indiscretion on the part of the patient leads to a repetition of the symptoms just described

During labour there is often a blood crisis characterised by an increase in the number of megalocytes normoblasts myelocytes and reticulocytes in the blood associated with cyanosis dyspnœa and rapidity of the pulse rate

Prognosis From what has been stated above it is obvious that the prognosis is grave for both the mother and child unless energetic treatment be adopted

When the patient seeks advice late in pregnancy and particularly if labour supervenes before effective treatment has been followed for some time the prognosis is grave If however the patient appears at an earlier stage and treatment has been continued for some time the prognosis improves

Treatment Whatever the method of treatment adopted it must be such as to produce a ready response and a rapid improvement in the condition Liver therapy is the most efficient There are several preparations some of which can be given by mouth and some by intravenous or intramuscular injections In the severer

types of case it would appear that it is best to start with intramuscular injections of liver extract, or even with intravenous injections. Occasionally the patient's condition may be such that an intravenous injection is not without danger. We prefer in such cases intramuscular injections of liver extract, of which there are a number of preparations on the market of high repute. Together with intravenous or intramuscular injections of liver extract, it is desirable to give by mouth preparations either of liver extract or hog's stomach or autolysed yeast. A preparation that has been found useful in these cases is Marmite, which contains vitamin B. But it must be realised that in cases which do not respond to

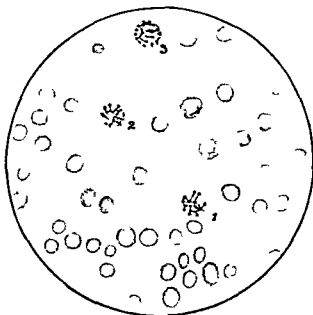


FIG. 64—Reticulocyte response in the treatment of anemias

1, 2, 3—Reticulocytes.

Marmite alone or do not show a sufficiently rapid or progressive rate of improvement it will be well to combine it with liver therapy either by the oral administration of liver extracts or by intravenous or intramuscular injections.

To note the response, a reticulocyte count should be made before the treatment is started and repeated every second day to determine if the reticulocytes have increased. It is also desirable to note the hemoglobin content and the red cell count. If these three counts are charted a very accurate idea of the response to the different methods of treatment can be obtained. The necessity for a chart will be more obvious when it is stated that in some cases various additional methods of treatment have to be adopted to procure a favourable and progressive response. Liver therapy

may not be sufficient in quantity, or it may not be sufficient by itself and may have to be combined with other methods of treatment. When liver is given by mouth it is necessary to realise that a sufficient quantity of liver should be administered. If whole liver, raw or lightly cooked, be given, approximately half a pound a day should be administered throughout the whole course of treatment from the stage of severe relapse to complete remission. In practice, however, gastric digestion is so impaired in the relapse stage as to make the ingestion of adequate doses difficult and in consequence liver extract or ventriculin is usually employed. As soon as possible, however, whole liver should be substituted as it is a great deal cheaper than liver extract and contains rich stores of vitamin, organic iron and amino acids of high nutritional value. The use of the whole gland eliminates the danger of using extracts which are comparatively inert or impotent.

In administering liver extract one may give a single large dose or a moderate dose repeated over a fairly long interval. Excessive quantities, however, are badly tolerated, especially in the severe types and should generally be avoided.

Besides liver therapy, the other accessory methods of treatment to be adopted are —

Vitamin Therapy It has been suggested that vitamin B₂ complex is one of the essential factors deficient in this condition, and for this reason Marmite is given. In association with liver therapy Marmite is useful.

Iron Although many cases improve remarkably with liver therapy and with preparations of hog's stomach such as ventriculin, the improvement is not as satisfactory or after a certain stage the patient does not show progressive improvement. In such cases the administration of iron is very useful. It should, however, be realised that iron should be given in large doses—60 to 90 grains of the scale preparations, such as iron and ammonium citrate given daily.

Hydrochloric Acid In view of the presence of hypochlorhydria in a good proportion of cases, it is desirable to administer $\frac{1}{2}$ to 1 drachm of the dilute acid in orange juice or water at the end of each meal.

Blood Transfusion This is a valuable method of therapy in certain cases of anæmia but it is doubtful if the severer types of pernicious anæmia are suitable for blood transfusion. Particularly in those cases where the blood count shows less than one million red cells, it is far from being the safe and simple procedure which it is suggested to be. The reaction that may set in, the rigors, the high temperature, the marked tachycardia, and in some cases signs of renal damage such as albumin and casts in the urine, no matter

how carefully the blood is matched or how slowly it is injected all add to the risks. Moreover the degenerated myocardium is unable to stand the additional strain of the reaction. While, therefore a note of warning has to be sounded as to the possible risks of blood transfusion in every case it should not however be thought that blood transfusion is not a valuable form of therapy in certain cases of severe anæmia. The exact procedure to be adopted will be discussed in another chapter but it is sufficient at present to state that it is a mistake in such cases to give a large blood transfusion. A greater amount of good will probably result from repeated transfusion with small quantities of blood. One need hardly emphasise the care that should be taken in the matching of the blood before transfusion is attempted whether it be with whole blood or with citrated blood.

THE CONDUCT OF LABOUR

It has already been suggested that labour adds considerably to the risks if the patient has not shown marked improvement after the commencement of the treatment. It is therefore obvious that *induction of labour has no place in the treatment of pernicious anæmia or for a matter of that in the treatment of any variety of anæmia during pregnancy*. The longer this inevitable event can be postponed so as to gain time in which to improve the general condition and particularly the hemopoietic system of the patient the greater is the possibility of survival of mother and child.

So far as labour is concerned in many cases it is precipitate. Premature labour is not infrequent but should the condition sufficiently improve labour may come on at full term. Particular care should be taken to see that there is no risk of puerperal sepsis. Interference should be limited to the minimum extent possible. Help in the second stage of labour may be needed to save the strain on the damaged heart. All operative procedure should be conducted with meticulous care as regards the avoidance of sepsis. Anæmic patients are more likely to develop sepsis during the puerperium.

The Puerperium The patient should be watched with care. All exertion should be forbidden. the diet should be light and nutritious liquid nourishment for the first few days being desirable. Liver therapy should be continued. glucose may be given at frequent intervals. The patient should not be allowed to sit up too soon and should be warned that the treatment should be continued for a sufficiently long time. In the severer types of anæmia it is better to forbid breast feeding.

THE SECONDARY ANÆMIAS

There are a number of conditions which give rise to secondary anæmias during pregnancy and puerperium. These are generally of the microcytic hypochromic type. Nutritional deficiency of various sorts, focal sepsis, poisons such as lead, the toxæmias of pregnancy, puerperal sepsis, diseases such as malaria, kala-azar, tuberculosis, intestinal parasites, syphilis, sudden antepartum or postpartum hæmorrhage may all give rise to secondary anæmia, sometimes of a mild and sometimes of a very grave nature. Particularly in the tropics there are a number of diseases which give rise to destruction of the red cells and diminution in the quantity of hæmoglobin, thus causing a severe type of anæmia characterised by a low colour index and diminution in the size of the red blood corpuscles. The particular routine examination that has already been suggested should be adopted in every one of these cases.

One of the most common causes of anæmia in the tropics is hookworm infection, and this is so frequently met with and is associated with such a heavy mortality in cases untreated or neglected that it is desirable to have a thorough knowledge of this disease as it affects pregnancy.

It has already been suggested that there is what may be called a physiological anæmia of pregnancy which is probably due to hydremia in pregnancy, so that the hæmoglobin is never 100 per cent, but varies between 80 and 90 per cent.

Treatment of Secondary Anæmias. The part played by anæmia in pregnancy has been referred to in detail and it has been suggested that where the hæmoglobin content is below 50 per cent, the prognosis for the mother is less favourable and the chances of premature termination of pregnancy are greater the lower the hæmoglobin content is. It should therefore be an imperative rule to treat the anæmia whenever it complicates pregnancy by (1) removing the causative factor concerned and (2) making good the blood deficiency. Removal of the causative factor is of prime importance, but in view of the low grade anæmia it may be necessary that the patient should be properly dieted, kept at rest and general stimulants given for periods varying from one to two weeks before the causative factor can be tackled. In many cases it is possible that both methods of treatment may be simultaneously adopted.

In the secondary anæmia treatment consists in supplying the deficiency, whether it be in the form of vitamins or in the form of hæmatinics. The appropriate treatment can only be elucidated by careful clinical and hæmatological study. It is no use prescribing iron for instance when the anæmia is due to a deficiency disease.

like scurvy or to an endocrine disorder like myxœdema. The patients who are severely anæmic should be confined to bed a generous mixed diet should be given rich in vitamins. It is desirable if the patient will take it to give fresh liver two or three times a week. Fresh air and sunshine and ultra violet therapy are ancillary methods of treatment. Iron is of great use in the majority of anæmias with low colour index especially those where defective absorption of iron is the principal factor. The various preparations of iron differ greatly in their activating properties. The ferrous salts are most active the scale preparations come next and then the ferric salts. Organic preparations of iron have less therapeutic value. Ferrous carbonate is very suitable. Large doses of iron should be given if it is to be effective 60 to 120 grains of the scale preparation of iron and ammonium citrate should be given daily in divided doses after food.

Hydrochloric acid is of value in the treatment of the dyspepsia in some cases of anæmia— $\frac{1}{2}$ to 1 drachm of the dilute acid being given with each meal.

Arsenic is another drug which is found useful along with iron. Other drugs that may be combined with iron therapy are copper and manganese. Liver therapy will be found beneficial in a proportion of cases.

Diseases of the Urinary System

The kidneys play a prominent role in the physiology of pregnancy as during this condition they have to excrete not only the products of increased maternal metabolism but also those of the foetus. The strain therefore is great and if the kidneys were previously damaged however slight it is likely that this additional strain will result in increased damage. Even with healthy kidney under certain circumstances the strain may be too great and evidence of damage becomes visible. The condition of the kidneys should therefore be particularly noted during the whole of pregnancy and every effort should be made to treat any pathological changes that appear sufficiently early to prevent the more permanent damage of the organ and onset of more serious symptom.

A thorough examination of the urinary system in pregnancy or the puerperium involve the following clinical tests —

(1) **Renal Efficiency Test** This can be done by one of the following methods —

(a) *Urea Concentration Test* In this test 10 grams of urea dissolved in 100 c.c. of water and flavoured with tincture of auranti are given to the patient just after she has emptied her bladder. Samples of urine are collected after one two and three hours.

and the urea is estimated by the hypobromite method. If this amounts to 2 per cent or over in one or more of the three specimens the kidneys are efficient according to this test. The volume of urine should not exceed 120 c c in the first hour or 100 c c in each of the second and third hours. Excessive diuresis may be due to release of water previously retained in the tissues and the test should be repeated.

(b) *The Blood Urea Clearance Test* This is a simple and more reliable test of estimating the urea excreting function of the kidneys. The principle of it is based on the relation of the blood urea concentration to the urea concentration in the urine secreted. The urine is collected at two periods with an interval of one hour the bladder being completely emptied on each occasion. Food is withheld for two hours previous to the test. Blood is taken for urea determination in between the two collections of urine. The urea content of the urine is estimated and the output of urea per minute calculated. If the blood urea concentration is now determined, the volume of blood cleared completely of urea can be calculated. A urea clearance of 50 or under is certain evidence of chronic nephritis.

(2) **Bacteriological Examination of Urine and Culture of the Same** This is very necessary in all cases where a urinary infection is suspected to establish the diagnosis and determine the organisms concerned. It is our experience that the majority of cases of prolonged puerperal pyrexia are due to a urinary infection either primary or secondary.

(3) **Cystoscopic Examination** This is sometimes of great value in determining the condition of the bladder and the presence of inflammation therein. It may be combined with catheterisation of the ureters which is useful as a therapeutic measure as well as a method of determining the presence or absence of infection in the pelvis of the kidney.

(4) **Radiographic Examination** Pyelography is a valuable means of determining the position and condition of the kidneys the presence of calculi hydronephrosis dilatation of the pelvis renal growths and tumours dilatation and irregularities in the course of the ureter. A drug opaque to X rays which is eliminated by the kidneys is introduced intravenously and radiograms are taken at short intervals after its injection. Uroselectan B is generally used for this purpose.

Manifestations of Renal Damage During pregnancy the kidneys may show evidence of damage from any of the following causes —

(a) A previously damaged kidney from any of the varieties of nephritis may during pregnancy, show evidence of increased damage owing to its inability to cope with the increased strain

The woman may have suffered from acute or chronic nephritis prior to pregnancy

(b) Acute nephritis may develop during the course of pregnancy in a kidney which has not been the seat of previous disease

(c) An acute nephritis may be superimposed on a previously damaged kidney the seat of a subacute chronic nephritis during pregnancy

(d) Occult nephritis In this condition the disease may be latent during the non gravid condition but when pregnancy supervenes particularly in the latter half of pregnancy the symptoms manifest themselves clearly

All forms of nephritis have a deleterious effect on pregnancy causing either abortion or premature labour in the majority of cases

(e) Besides these different forms of nephritis the toxæmic kidney of pregnancy which later may result in eclampsia has been discussed in the chapter on toxæmias of pregnancy

The *diagnosis of nephritis* is made by an examination of the urine and it has already been emphasised that this should be a matter of routine during the whole course of pregnancy particularly after the twenty fourth week. The presence of albumin will first arouse suspicion as to the possibilities of a nephritis. The specimen should always be a catheter specimen and it is desirable that the other causes which may result in albuminuria such as cystitis should be eliminated

When an acute attack of nephritis supervenes on a latent nephritis the prognosis is grave. It is rendered worse by any complication such as œdema of the lungs ascites effusion into the pleura or albuminuric retinitis. In some cases eclampsia may supervene

Treatment In the presence of chronic nephritis the woman runs a serious risk when she becomes pregnant. When renal inefficiency has been manifest in the previous pregnancy by an attack of eclampsia or otherwise it is desirable that the woman should be examined at periodic intervals and a renal efficiency test performed before another conception is risked. Should however pregnancy occur in a case where there has been previous evidence of diseased kidneys the patient should be watched with great care from the commencement of pregnancy. The obstetrician should be on the lookout for any of the threatening symptoms of eclampsia and should be prepared, if the condition cannot be brought under control to induce labour. Albuminuric retinitis persistent anasarca a damaged heart persistent high blood pressure or an increasing degree of albuminuria despite all treatment for over a week usually necessitates interruption of pregnancy particularly if the fœtus has passed the period of viability

When however the nephritis is discovered in the early weeks

of pregnancy the question arises whether pregnancy should be allowed to continue. It is difficult to lay down any dogmatic rule but if careful dietetic treatment, rest and general measures do not produce an appreciable improvement it is desirable to interrupt pregnancy for the following reasons. It is rarely that the pregnant woman can be tided safely over till the child is viable without some acute manifestations appearing. Secondly, the child does not survive in many of these cases and thirdly the prolonged damage to the kidney in association with pregnancy impairs the life of the mother to such a serious extent that it is questionable whether it is justifiable to allow the pregnancy to continue. On the other hand if the child is near the viability period it is perhaps permissible to temporise for a week or so in order to give the child a chance of surviving.

Careful examination of the urine, quantitative estimation of the albumin and the total quantity of the urine voided in twenty-four hours, estimation of the blood urea and non-protein nitrogen content, a record of the blood pressure and the associated signs and symptoms together with a periodic examination of the retina for signs of albuminuric retinitis should be a matter of routine. Dietetic and medicinal measures for the relief of the strain on the damaged kidney must be instituted. These have been dealt with in detail in the chapter on toxæmia.

Just before or during labour if there is any swelling of the labia it should be relieved by painting with tincture of iodine and then puncturing them. Hot compresses are very useful in cases of œdema. The second stage of labour should be terminated as soon as possible by the application of forceps or by extracting the child in breech presentations. As labour is more often premature there may not be much difficulty in terminating it. The puerperium requires added care in view of the possibilities of infection both urinary and general.

Urinary Infections in Pregnancy

Pyelitis, Pyelonephritis and Ureteritis

It is not often realised what a dominant part urinary infection plays in the causation of serious symptoms during pregnancy. In the majority of cases the symptoms are mild and the infection clears up before much mischief is done. In some cases however severe symptoms manifest themselves leading to the condition known as *pyelitis gravidarum* and sometimes to severe signs of sepsis in the puerperium.

To appreciate fully the causes which lead to infection of the urinary tract during pregnancy it is necessary to recognise the

anatomical and physiological changes that occur during the course of pregnancy

The Anatomy of the Ureters The ureter in its lumbar and iliac portion lies in contact with the aponeurosis of the psoas muscle about one finger breadth from the spine. In front it is in intimate relation with the posterior peritoneum. It has a wide range of mobility in its abdominal portion a fact to be borne in mind in considering the changes that occur during pregnancy. At the pelvic brim the ureters cross the iliac vessels obliquely where the common iliac artery divides into the internal and external divisions. At this point there is a difference in the two sides due to the difference in the course of the common iliac vessels. The right common iliac vessel crosses the vertebral column from left to right and therefore lies more anteriorly than the left. As the right ureter must cross over the right common iliac vessel almost at a right angle to gain the pelvis it has a more exposed course than the left which is partly protected by the promontory of the sacrum and the sigmoid colon and its mesentery which lie anterior to it.

Physiological Changes The physiological changes that occur in the urinary tract during pregnancy have an important bearing on the pathology of the urinary tract during the pregnancy and puerperium. The most constant changes are dilatation of the pelvis and calyces of one or both ureters and lateral displacement of the structures. The right kidney and ureter are affected more often than the left. But the left ureter is displaced laterally more frequently than the right. The cause of ureteral dilatation is two fold (1) the primary changes in the ureter are hormonal in action and (2) the pressure of the uterus causes a constriction at the pelvic brim. The uterine ureters and large bowel undergo an atonic change which commences during the early months of pregnancy and persists until the 32nd week when it slowly diminishes so that at term the uterine musculature is not only irritable but contracts vigorously. The ureter in its relaxed state is unable to expel the urine excreted by the kidney because of the steadily increasing weight upon it as it gradually dilates in so doing it contains an increasing column of more or less static urine. Residual urine whether it occurs in the bladder-ureter or pelvis of the kidney is a source of danger which has long been recognised by urologists as it is prone to infection and once contaminated allows of such rapid growth of micro organisms as to make it difficult for a cure so long as the stagnation persists. The pregnant woman with her dilated ureters is therefore in constant risk of developing an upper urinary tract infection but as only 2 per cent of the patients develop pyelitis gravidarum there must be some protective force at work.

How does the infection occur? There are four channels by which the infection may spread to the urinary tract under favourable circumstances —

- (a) by the blood stream
- (b) by the lymphatic channel
- (c) as an ascending infection along the ureter
- (d) directly from the intestines

The immediate proximity of the ascending colon to the right kidney pelvis gives rise to the possibility of a primary isolated infection of the pelvis of the right kidney by way of the lymph stream or by contiguity

Bacteriology The dominant organism responsible is the *bacillus coli*. The presence of the colon bacillus in the urinary tract is the result of two factors (1) the constant penetration of the bacilli from the intestinal tract and (2) the multiplication of these bacilli in the urinary tract. There is a definite relationship between pyelocystitis and the pathological condition in the intestinal canal, and between the type of colon bacillus present in the urinary tract and the type of those in the intestinal canal. In cases of pyelocystitis it is necessary to pay special attention to the function of the intestines, and the problem of rendering the bacterial flora of the intestines normal should be tackled.

Among other micro-organisms may be mentioned streptococci, staphylococci, pneumococci, gonococci and the typhoid and para typhoid group of bacteria, alone or in combination with the coli organisms.

The methods used to study the effect of infection on the urinary tract are —

- (a) Chromocystoscopy
- (b) Catheterisation of the ureters
- (c) Determination of the urea concentration of the urine of each kidney
- (d) Urea clearance test
- (e) Intravenous pyelography

Urinary infection may occur at different stages of pregnancy

(1) *First trimester and early part of the second trimester* i.e. up to the 20th week. At this period the most dominant factor in the causation of urinary infection is displacement of the gravid uterus. The commonest displacement is a backward displacement, retroversion or retroflexion. Sometimes prolapse occurs in such cases the cervix is displaced, pulling with it the bladder and urethra and constriction results. The inability to pass urine results in stasis and decomposition, allowing organisms to gain admission freely. In some cases the urinary infection is so pronounced that

termination of pregnancy becomes inevitable. Urinary antiseptics, free drainage of the bladder and correction of the displacement of the gravid uterus are methods of treatment to be adopted. When the gravid uterus gradually rises into the abdomen and spontaneous rectification occurs there may be alleviation of the symptoms. Rarely sacculation of the uterus results and when posterior sacculation occurs the resultant interference with the natural position of the bladder and urethra may cause retention and infection which may be very persistent. In one such case it was necessary to evacuate the uterus at the 20th week by a vaginal hysterotomy after which the urinary infection cleared up.

(b) *Urinary infection during the second and third trimesters of pregnancy*. At this period the result of infection is a pyelitis, pyelonephritis or pyelocystitis. The most important factor responsible for infection during this period is urinary stasis. It generally occurs between the 20th and 36th week, being most frequent between the 28th and 32nd weeks of pregnancy.

Signs and Symptoms. It is customary to divide cases of pyelitis of pregnancy into two groups, acute and chronic, according to the severity of the urinary symptoms. Pyelitis is more common in primipare than in multipare; occasionally it is met with in the puerperium when it is likely to be mistaken for uterine infection. The patient might have been enjoying comparatively good health, slight attacks of pain in the region of the kidney may be complained of or perhaps painful micturition. There is usually a dull aching pain in the right flank associated with fever, chills, sweating, malaise and sometimes nausea and vomiting. In some cases this is preceded by dysuria and hæmaturia but not often. In some cases fever may be present.

On palpation in the flanks the kidneys may be found to be tender and tenderness may also be elicited along the course of the ureters. There is tenderness in the vertebral angle and the point of greatest tenderness is at the junction of the outer border of the lumbosacral muscle with the lower margin of the 12th rib (Cova's point). The urine is cloudy and contains clumps of white blood corpuscles and many bacteria. The latter are usually *Bacillus coli* with sometimes staphylococci and streptococci as secondary invaders. The temperature runs a hectic course with elevations frequently associated with chill. The urine practically never becomes sterile before the end of pregnancy and exacerbations during the course of pregnancy are common. In severe cases of pyelitis miscarriage or premature labour may occur.

Diagnosis. The diagnosis of these complications usually offers little difficulty provided the fact is borne in mind that during this period of pregnancy they are not infrequent. Pain in the lumbar region associated with fever of the characteristic nature

the quantity of alkali given by mouth may be reduced by giving it at six or eight hourly intervals until the temperature has been normal for a week and the acute symptoms have subsided. The urine is then made acid with acid sodium phosphate 15 to 30 grains and hexamine 10 to 15 grains given three times a day after food. Other drugs that can be given instead of hexamine are cystopurin 10 grains three times a day, hexyl resorcinol 2 to 3 grains. A change of urinary antiseptics is sometimes advisable. In some cases hexamine with methylene blue may prove less irritating than hexamine alone and may be given without the addition of an acid mixture. When *bacillus coli* has been isolated in cases of pyelitis, cytotropin has been found useful and may be given either by the intravenous or the intramuscular route. The latter is preferred as occasionally severe reaction results from the intravenous administration which may lead to interruption of pregnancy and sometimes even collapse.

Mandelic acid is definitely superior to other drugs in urinary infection. Several preparations of this drug are on the market which can be tried. Apparently it is most effective against *bacillus coli* and less so against staphylococci, streptococci, *bacillus pyocyaneus*, *proteus*, etc.

Auto vaccines may also be used in suitable cases.

In recent years a ketogenic diet has been introduced in the treatment of this condition. This is based on the observation that when such a diet is given to patients suffering from other diseases the urine passed does not putrify on standing for several days, hence the diet will inhibit the growth of micro organisms ultimately rendering the urine sterile. The ketogenic diet contains a preponderance of fats over carbohydrates and proteins, the proportion being 6 : 1 as fat is to carbohydrates plus proteins. The diet is usually required for one to three weeks. The fluid intake should be limited to 2½ pints and it is essential that no other food should be taken between meals.

When improvement does not still take place ureteral catheterisation as a method of treatment has been strongly advocated. Catheterisation of the ureters removes the factor of urinary stasis and permits free drainage of the kidney pelvis. Catheters are inserted into both ureters in spite of unilateral preponderance of signs and symptoms. They are left in place for four to six days and are reinserted if necessary.

The question of termination of pregnancy is an important one for consideration. Pyelonephritis particularly when bilateral may indicate the necessity for emptying of the uterus. It is very rarely necessary to adopt surgical therapy for this condition.

BACILLURIA

This is not an infrequent complication in pregnancy. It occasionally manifests itself in an aggravated form in the puerperium. The need for a thorough examination of the urinary tract during pregnancy, and in some cases during the puerperium is obvious from the large number of cases of puerperal infection which are complicated with infection of the urinary tract. In fact it is well to remember in the treatment of puerperal sepsis that such sepsis may have originated from a bacilluria.

Diseases of Metabolism

DIABETES

During pregnancy the presence of sugar in the urine is not infrequently demonstrated by any of the ordinary tests such as Fehling's or Benedict's. The presence of sugar however does not necessarily indicate the presence of true diabetes. As a matter of fact the occurrence of glycosuria in pregnancy may be due to several causes namely —

- (1) An innocent form of glycosuria due to lessened sugar tolerance in pregnancy
- (2) A glycosuria innocent in itself but possibly suggestive of a commencing toxæmia
- (3) A lactosuria due to hyperfunction of the breasts
- (4) Disturbances of the endocrine system
- (5) True diabetes mellitus

It is of importance to differentiate these conditions and to establish definitely whether true diabetes is present or not. This can only be done by a sugar tolerance test which involves a blood sugar curve estimation.

Effect of Pregnancy on Diabetes. A diabetic woman may become pregnant more rarely a woman who is pregnant may develop diabetes. In some cases the woman may not be affected at all by the presence of diabetes while in others she may improve and have better health particularly in the later weeks due probably to the activity of the foetal pancreas. On the other hand in a few cases an aggravation of the symptoms occurs and the disease may take on a more severe form during pregnancy. Cases have been recorded where diabetes has occurred during pregnancy and has disappeared after labour while in some cases although there is a great improvement after the confinement the disease reappears later on.

Pregnancy may light up a latent diabetes and unless the condition is controlled there may appear some of the complications of diabetes mellitu. such as acidosis coma etc

Effect of Diabetes on Pregnancy So far as the foetus is concerned diabetes has an adverse effect. The foetus generally is excessive in size. This may be due to the unusual amounts of sugar brought to the placenta by the maternal blood. In the four cases of true diabetes that have been under our observation the children weighed between 12 and 14 lbs at birth. A fair proportion of pregnancies end in abortion or premature labour and it is not uncommon to find that over a third of the children born at term are born dead. Not infrequently the foetus dies *in utero* near term.

Diagnosis The diagnosis of this condition rests upon the clinical symptoms of polyuria polydypsia bulimia etc together with the presence in the urine of sugar acetone diacetic acid or beta-oxybutyric acid and upon the estimation of the blood sugar and nature of the sugar tolerance curve.

Prognosis This depends upon the severity of the attack and the treatment adopted and the co-operation on the part of the patient. Before the discovery of insulin and modern methods of treatment of this condition the disease was dreaded during pregnancy and the prognosis was undoubtedly grave. While the prognosis has improved so far as the mother is concerned the foetal prognosis is still bad. Apart from the tendency for interruption of pregnancy before term the excessive size of the child leading to severe dystocia the sudden death of the foetus at or near term and the increased risks of neonatal mortality diminish the chances of the foetus surviving.

Treatment When diabetes has been diagnosed in pregnancy the patient should be watched and kept under dietetic and medicinal treatment. The advice of a physician should be obtained from time to time.

The principles of treatment are —

- (1) The blood sugar of the patient should be estimated from time to time and kept within the normal limits of 0.8 to 1.2 mgm per cent.
- (2) The urine should be frequently examined for the presence of acetone diacetic acid etc and prompt measures taken to see that these disappear from the urine.
- (3) The life of the patient should be so regulated that no extra strain physical or mental is allowed.

In the mild type of case moderate restriction of carbohydrates may be sufficient to prevent glycosuria but in the majority of cases this is quite inadequate. A suitable dietary should be drawn up and with the use of insulin it is not difficult to tide over the period of pregnancy safely.

The conduct of labour requires care. It is rarely necessary to resort to termination of pregnancy in the early half of gestation. Most cases can now be taken to term and labour allowed to come on by natural methods.

The question may have to be decided whether with an excessively large sized foetus it is not necessary to resort to the abdominal mode of delivery. We feel after experiencing the difficulties of vaginal delivery with large foetuses that if the foetal heart sounds were good abdominal delivery would save the mother the grave risks incidental to a difficult vaginal delivery and favour a live birth.

It has been noted that in certain cases sudden death of the foetus occurs in the last weeks of pregnancy. How far this may be due to a hyper- or hypo glycaemia is not definitely known. If a previous history is available of such intra uterine death occurring it is safer to induce labour at the thirty sixth week. Another indication for induction is excessive growth of the foetus *in utero* the size of the foetal ovoid and perhaps the previous history would lead one to suspect this.

The risks of puerperal sepsis must be borne in mind and the patient should be carefully nursed and the urine periodically tested for any signs of acidosis. In the milder forms of the disease lactation may be permitted.

Hypothyroidism and Thyrotoxicosis

HYPOTHYROIDISM

In this condition sterility is generally the rule but occasionally a pregnant woman may develop signs and symptoms of myxoedema either in association with a colloid goitre or independent of it. In the majority of such cases abortion or miscarriage results. If however the symptoms appear at a late stage in pregnancy the child is likely to be born a cretin. In such cases congenital goitre has been noted. The use of adequate thyroid extract is indicated in all such cases and cases have been reported where pregnancy has been carried to term by the administration of thyroid. Care must be taken with the new born to note any symptoms of hypothyroidism and to treat the condition at an early stage.

THYROTOXICOSIS

This grave affection though rare occasionally complicates pregnancy. The onset may be sudden or insidious. It may occur during pregnancy or may ante date conception. In some cases there is a marked increase in the severity of the symptoms of thyrotoxicosis with the onset of pregnancy. Occasionally however the toxicosis may diminish late in the course of pregnancy with an exacerbation during labour and gradual subsidence during the puerperium.

Both forms of dysentery are very common in the tropics and occur in pregnant women just as frequently as in the non pregnant

BACILLARY DYSENTERY

Thus severe complication may be associated with a fairly high degree of morbidity and mortality in the pregnant woman unless suitably treated. Occasionally the infection is mild but in some cases particularly if due to the *Shiga bacillus* it may be severe. Toxæmia and dehydration play an important role in the clinical picture. Fulminant types are also met with as well as chronic ones. The bowels may be opened from five to fifty times a day and at the height of the attack abortion miscarriage or premature labour may occur. The severest cases may die in a state of collapse with subnormal temperature and cold extremities. In the ordinary acute cases the stools rapidly lose their feculent character and consist more of mucus with bright red blood.

Diagnosis It is of the utmost importance that whenever dysentery occurs in a pregnant woman early steps should be taken to find out after ascertaining the clinical history and examining the patient carefully the causative organism concerned. Immediate microscopic examination of the stools should be made. A large number of polymorphonuclear leucocytes along with red blood corpuscles may be present. The stools should be sent for culture which will give a high percentage of positive results. It is not desirable however to wait for the culture result but treatment should be undertaken for an acute condition such as this and we prefer to treat every case as one of possible bacillary dysentery unless *Entamoeba histolytica* has been definitely found on examination. On the other hand it must not be forgotten that a combination of the two types may be present—the amœbic as well as the bacillary and if the effects of treatment do not produce any definite response for the amœbic infection it may be presumed that the dysentery is probably a mixed infection.

Treatment Prophylactic measures are undoubtedly useful in the presence of outbreaks of dysentery in the locality. Treatment should generally aim at promoting rest and counteracting the toxæmia and dehydration. The diet should be regulated. For the first day only water or fruit juice or small quantities of albumin water or barley water should be given. Later clear soups arrow root and sago conjees may be allowed. Glucose may be given at frequent intervals. A preliminary dose of castor oil (1 oz.) with tincture opii (10 to 15 minims) may be given followed by drachm doses of sodium sulphate every two or three hours till the stools lose their dysenteric character. Anti dysenteric serum should be given early in the disease and in the *Shiga* infection the serum

may be given intravenously. For the dehydration hyper tonic saline or gum arabic solution is useful intravenously. Adrenalin, 0.5 c.c. of 1 in 1000 solution may be given for the collapse.

In recent years much progress has been made with the use of the specific bacteriophage given three daily or every four hours particularly in the severe cases. In other cases polyvalent anti dysenteric serum may be given in large doses of 30 to 40 c.c. and repeated for three days. Care should however, be taken to see that the patient is de-sensitised, if necessary, before the serum is given.

AMŒBIC DYSENTERY

This is due to the infection of the colon with *Entamoeba histolytica* and occurs mainly in the tropical and subtropical regions. The symptoms differ from those of the bacillary type in that the onset is generally insidious, commencing with afebrile diarrhoea. Occasionally, however, the onset is acute, as in bacillary dysentery with fever pain griping and purging associated with frequent bloody mucoid stools. In the majority of cases, however, the signs of toxæmia are not present. Many of these cases run a chronic course, and even without specific treatment the tendency for amœbic dysentery is to improve temporarily, but relapses are frequent and very characteristic of the disease.

The diagnosis is usually made by examining the fresh mucus under the microscope.

The disease can be easily brought under control with the use of emetine injections, intramuscularly or subcutaneously, in 1 to 1 grain doses daily for a period not exceeding ten days. Emetine bismuth iodide is preferable to emetine in the chronic cases and in carriers who show the cysts of amœbæ. It is best given on an empty stomach late at night, in gelatine capsules four hours after the last feed. Yatren No. 105 may also be given by the mouth. It is generally advisable after the acute stage is over to continue the treatment with yatren pills. In the chronic cases particularly where amœbic cysts are present, a combination of yatren and emetine bismuth iodide is desirable. It must be realised that amœbic dysentery may sometimes lead to amœbic hepatitis and later to hepatic abscess if neglected.

It is rare for pregnancy to be interrupted but if the woman is near term and the condition is acute labour may set in.

In the puerperium particular care should be taken with both forms of dysentery to see that septic infection does not occur. Careless handling of the external genitals by the patient or the midwife has sometimes been responsible for the causation of puerperal sepsis.

A type of dysentery very common in the tropics in the puerperium which is attended with a high degree of mortality and morbidity and severe anaemia is due generally to the Flexner infection. In other cases the dysentery might occur for the first time in the puerperium the patients having been carriers of the infection for a long time previously.

Diseases of the Nervous System

CHOREA GRAVIDARUM

This is a somewhat rare complication of pregnancy and generally occurs in young primigravidae. The disease is characterised by the occurrence of spontaneous involuntary movements irregular in time place of occurrence and nature and by incoordination of the voluntary movements muscular weakness and a variable degree of psychic disturbances.

The disease generally occurs in the first trimester of pregnancy and is liable to recur with subsequent pregnancies. In many cases it almost appears as if the pregnancy was the obvious cause for the condition.

Clinical Features The onset is usually gradual and when the disease is well marked the characteristic symptoms are—

- (1) Involuntary movements
- (2) Ataxy or loss of precision of voluntary movements
- (3) Weakness of voluntary movements
- (4) Emotional instability and other psychic disturbances

The involuntary movements are always irregular as regards the time and nature of their occurrence. In severe cases speech may be difficult the words being articulated slowly in slurred monosyllables. In the upper extremities the movements appear first in the hand. The lower extremities are generally less severely affected. The gait tends to be clumsy and insecure. The face is usually the first region to present movements and it is always affected bilaterally. So far as the limbs are concerned the movements may be confined to one side more often to the left. Choreic movements cease during sleep and except in severe forms can be controlled more or less by voluntary effort. Loss of energy is shown in the mild cases by incapacity for exertion and undue fatigue.

Incoordination of voluntary movements may be the first sign and it may progress to choreic movements. Psychic disturbances are common some degree of emotional instability failure of attention and depression being present in most cases. The patient's behaviour may change she may laugh or weep without reason become capricious irritable and obstinate. Cardiovascular changes

may manifest themselves later in chorea. Usually the disease tends to a spontaneous termination after a variable time extending from six weeks to six months.

Prognosis A small proportion of cases about 2 per cent end fatally. In pregnancy however chorea has got a slightly higher mortality than in the non gravid condition. Death from chorea in pregnant mothers results more often from abortion whether spontaneous or artificially induced and in others it is due to complications such as endocarditis pericarditis myocarditis and in some cases hyperpyrexia.

Diagnosis is easy from the nature of the involuntary movements which are characteristic of the disease.

Treatment The most essential consideration is rest physical and mental. Absolute rest in bed for several days freedom from irritation and presence of companions who will be interesting and pleasant should be ensured. Light nutritious diet should be provided for. In severe cases the patient should be guarded against possible risks of injury and food given with care. Benger's Food glucose lactose and fruit juice should be given in plenty. The addition of alcohol is sometimes of great value. When the patient is improving mild exercises of the muscles are desirable. Warm and tepid baths given regularly are always useful. As for drugs salicylic acid or any of its preparations is useful. 10 to 15 grains may be given three or four times a day. Arsenic is also of value 5 minims of liquor arsenicalis given three or four times a day. Antipyrin may be given in doses of 10 grains three times a day. The administration of hyoscine is sometimes useful to promote sleep. The bromides have little or no value as sedatives. In addition to the above iron glycerophosphates hypophosphates strychnine and cod liver oil are of value.

Ordinarily it is not desirable to interfere with pregnancy in this condition. In some cases however where the condition persists in spite of treatment or where jaundice pyrexia or delirium sets in it may be advisable to empty the uterus. The question of Cæsarean section may have to be considered when the disease occurs in the last weeks of pregnancy.

Deficiency Diseases

OSTEOMALACIA

This is a chronic disease occurring usually in females characterised by decalcification and weakness of the bones ultimately resulting in various forms of deformity and sometimes fracture of the bones.

Although osteomalacia is rare in most parts of the world it would appear to be very frequent in certain endemic areas. In Europe the disease is prevalent in the south of Italy in the western

districts of Switzerland in certain portions of south Germany and Austria. It is a fairly common disease in northern India particularly in the Kangra valley and all over Bengal United Provinces the Punjab and portions of Bombay. The disease is practically unknown in southern India and in the few cases that have been observed by us the patients have been sojourners from northern India.

It is much more common in women and usually occurs between the twentieth and thirtieth years although cases have been noted at a much earlier age. It is a deficiency disease due to the lack of certain vitamins and occurring more commonly under poor hygienic surroundings with lack of sunlight. It is not confined to the poor although it is naturally more frequent among such classes.

Causes Among the causes that may predispose to this condition are deficiency of ovarian function other varieties of endocrine insufficiency infective causes as after a severe attack of puerperal fever typhoid or scarlet fever or morbid conditions of the thyroid and parathyroid glands. There is no doubt that pregnancy is the main predisposing factor in the majority of cases.

Symptoms The onset may be insidious so that the disease may not be recognised till an advanced stage. Pain particularly referable to the bones in the pelvic region and back and sometimes to the extremities may be a prominent symptom. Tenderness on pressure over the affected bones may be present. Deformity of the spine or lower extremities may be observed and fracture of the bones from very trivial causes may be noted. In a woman who is pregnant any symptom referable to the bones should always arouse the suspicion of osteomalacia. Pelvic deformity occurs early. There may be general weakness associated with atrophy of the muscles. Symptoms of anaemia occur early and tetany and fibrillary twitchings of the muscles may be noted.

When the disease is more definitely established there may be gastric or intestinal symptoms distension of the abdomen indigestion and severe cramps in the abdomen. Occasionally fits may occur which may resemble hysterical fits.

When the disease has persisted for some time the patient is unable to walk the pelvic and the long bones are very much deformed. Severe pain may be present in the acute forms of the disease. When the disease has become chronic the pains are not severe and by this time deformities of the spinal column such as lordosis or kyphosis may be present and the patient may assume a waddling gait. Soon however the patient is unable to move about and becomes hopelessly crippled. The commonest form of deformity of the pelvis resulting from osteomalacia is the *triradiate pelvis*. This is particularly to be noted in view of the complications that it causes at the time of labour.

The extent of the deformity resulting from osteomalacia depends entirely upon the degree of softening of the pelvic bones. When the bones have become very soft the pressure exerted upon the bones by the femora on either side and by the weight of the trunk compresses it to such an extent that the promontory is pushed downwards and forwards while the femora push the lateral walls of the pelvis inward. It is from this cause that the superior strait of the pelvis presents a triradiate appearance. The pubic arch becomes very narrow the rami being pushed markedly forward giving rise to the characteristic beak like protuberance on the anterior wall of the pelvis. The size of the pelvic cavity is very much diminished.

Diagnosis The condition may be diagnosed from the characteristic clinical history of the disease its occurrence in the endemic area the peculiar muscular palsies the pains in the joints the softening of the bones and various deformities. With each successive pregnancy the symptoms may become intensified. After delivery the pains generally disappear and when the patient begins to move about she realises the nature of the deformities.

Treatment—Prophylactic In all endemic areas pregnant women should be examined with care and it is preferable to give them an abundant supply of vitamins particularly vitamins A and D in the shape of cod liver oil. Exposure to sunlight is essential. Suitable diet which will include plenty of fresh milk and a sufficiency of proteins must be provided for.

Curative When the disease is seen in its early stages energetic treatment ought to be adopted. Sunlight plenty of cod liver oil and mild exercises should be prescribed. Attention to the general hygienic condition is of importance. The diet should be liberal and comprise foods rich in calcium salts and phosphorus such as milk eggs fish sweet bread and meat. Calcium salts especially

Another method of treatment that may be adopted at present is the Porte's or Beyrou't's method with exteriorisation of the uterus.

When a definitely osteomalacic deformed woman again becomes pregnant the question of therapeutic abortion may have to be considered since the continuance of the pregnancy may lead to a rapid aggravation of the disease.

The Infant It is necessary to realise that the infants of osteomalacic mothers may show early signs of rickets. It is desirable in such cases to take suitable precautions by giving them sunlight exposures or ultra violet ray therapy with cod liver oil etc. They should be carefully looked after as in the majority of these cases artificial feeding is essential.

SPRUE

Sprue and sprue like diarrhoeas are fairly frequent in pregnant women. This is one of the tropical diseases which not infrequently occurs in various parts of India, China, Cochinchina, Ceylon and some of the islands of the Malay Archipelago. In a large number of cases the disease occurs in those who are ill nourished and devitaminised. That it is a deficiency disease due to lack of certain vitamins is becoming more commonly recognised now. It gives rise to a type of anaemia which is megalocytic sometimes hyperchromic sometimes hypochromic. Whether the disease is due to a deficiency in the diet or to failure of absorption it is more amenable to treatment on the basis of a deficiency disease.

When it occurs in pregnancy it results in a great deal of emaciation, asthenia and severe anaemia and at the height of the disease termination of pregnancy may occur. The tongue is often sore, the abdomen distended, intestinal flatulence present and in neglected cases oedema of the feet, cramps and tetany may supervene. Even with extreme forms of anaemia no neurological manifestations are present. In some cases a mild attack of sprue may become aggravated. The possibility of puerperal sepsis must be reckoned with in the devitalised, emaciated patients with large and frequent stools.

The prognosis of this condition which was at one time much graver has fortunately improved with modern methods of treatment. The essential factors in the treatment of this condition are —

- (1) Dietetic restrictions to give the alimentary tract as much rest as possible.
- (2) The effective treatment of the megalocytic anaemia present and
- (3) The supply of such deficiencies as may be demonstrated.

The patient should be put to bed for several weeks under proper hygienic surroundings and the diet should be bland and non-irritating. It is best to begin with milk, commencing with two to three pints a day, and gradually increase it to four or five pints. Tomato juice, fresh fruit juice and glucose may also be given. Later the food can be gradually increased so as to combine a fairly high proportion of protein with a low one of fat and carbohydrates.

So far as the anemia is concerned, its treatment should be along the lines already discussed under anemias of pregnancy, keeping a control by the estimation of the reticulocytes. Liver therapy is most effective. In the severe cases, intravenous or intramuscular injections of hepatax P. A. F. have certainly been of great value. Another preparation which has been found equally successful is campolon. Many other preparations are now available in the market for intramuscular injections. Marmite can also be given by mouth, but it is not so well tolerated and large doses are required. Blood transfusion, if attempted, should be done with the greatest caution and never should more than 100 c c of blood be transfused. In the convalescent stage iron in large doses is necessary, 60 to 90 grains of the scale preparations being given per day or ferrous carbonate (3 grain pill) three or four times a day. When the patient is able to take better nourishment, raw liver juice or lightly cooked liver may also be given. Along with this treatment any demonstrable deficiencies should be supplied. In cases of hypochlorhydria or achlorhydria $\frac{1}{2}$ to 1 drachm of dilute hydrochloric acid in orange juice, with meals, is indicated. If the blood calcium is low and there is a tendency for tetany, calcium lactate 20 to 40 grains thrice daily, will be found useful.

For diarrhoea it is well to give drugs such as kaolin, tannalbin pulvis creta aromaticus, or small doses of pulvis kino co., etc.

If labour starts in spite of precautions it should be assisted in the most conservative manner—the second stage being shortened if necessary by the application of forceps. Particular care should be taken in all manipulations to avoid any possibility of sepsis.

During the puerperium efficient nursing is necessary to prevent infection.

Diseases of the Skin

ALBINISM

This is a congenital condition where there is complete absence of pigment in the skin and other epidermal structures. The hair is white the eyes pink from the absence of pigment in the iris and there is no pigmentation in the skin, even when exposed to the strongest sun's rays. Nystagmus is not infrequent in these cases and the absence of pigment is possibly responsible for the inability of the patient to see the sun's rays or even ordinary daylight.

The importance of albinism as a complication of pregnancy rests on the fact that after termination of pregnancy, puerperal sepsis is not infrequent. In four cases that have been under our observation, in spite of the fact that every care was taken and labour was allowed to terminate naturally, puerperal sepsis of a mild or severe degree occurred in every one of them. In two the women died, while in the other two recovery occurred after a prolonged illness and convalescence. The exact cause for this infection was not evident. It is not unlikely that deficiency of certain endocrine factors, which perhaps are responsible for the condition of albinism, might have played their part in the causation of sepsis.

Surgical Emergencies during Pregnancy

The question of how far operative measures affect adversely the pregnant woman has been long discussed. The view commonly held is that it is not desirable that a pregnant woman should be operated on, because the possibilities of interruption of pregnancy add risks to the mother. As a general rule it may be said that if there is no urgency about the operation, it should be postponed till after the pregnancy terminates. On the other hand, improved technique and safer methods of anaesthesia have made surgery in the pregnant woman less risky than before. There are however certain emergency operations which cannot possibly be delayed. The occurrence of any acute abdominal crisis, such as appendicitis, a twisted ovarian cyst, acute intestinal obstruction etc. necessitates immediate operation and should be undertaken irrespective of the period of pregnancy. Operations performed in the early months of pregnancy, in the first or second trimester, have certainly a much better prognosis. We have not infrequently operated on the pregnant woman during this period and removed an appendix, ovarian cysts, a twisted enlarged malerial spleen and sub peritoneal fibroids, and the mortality was not any greater than in the non gravid condition, the average incidence of abortion except when the uterus was intimately involved was not greater. In the later months of pregnancy, on the other hand other difficulties arise which would make one hesitate to resort to operative measures except when a definite diagnosis is made and the operation is imperative. When an abdominal operation is indicated in the last weeks of pregnancy, the question should be considered whether it may not be desirable simultaneously to deal with pregnancy.

Appendicitis This is by no means an uncommon complication in the pregnant woman. Primary appendicitis is very rare but recurrent attacks in a woman who has once had an attack of appendicitis are by no means infrequent during the course of pregnancy. In cases of appendicitis occurring in pregnant women,

it should be realised that perforation and suppurative peritonitis tend to occur in a much larger proportion of cases owing to the lack of any protective adhesions

The prognosis of this condition is graver during pregnancy but is more favourable if it occurs earlier in pregnancy than in the later months. Earlier in pregnancy the favourable prognostic outlook is due to two factors. The condition is more easily and quickly recognised and such operative measures as are indicated can be adopted without much difficulty, as at that time the pregnant uterus does not cause the same hindrance to the proper location of the appendix and its removal. When it occurs in the later weeks of pregnancy or at the time of labour the danger is greatest. Early diagnosis of this condition is of the greatest importance.

When a pregnant woman complains of pain in the right side of the abdomen associated with an elevation of temperature and a tendency to vomit with slight rigidity of the abdominal wall the diagnosis of appendicitis is entirely justified unless by a process of differential diagnosis it can be eliminated. Leucocytosis is usually present in varying grades.

Appendicitis may have to be differentiated from several other conditions which also cause abdominal pain, nausea and vomiting. Among such conditions are tubal gestation, acute salpingitis, twisted ovarian cyst, pyelitis, ureteral colic, intestinal obstruction, pernicious vomiting of pregnancy, a perforated gastric ulcer, biliary colic, diverticulitis, pancreatitis, etc. Although a very large number of conditions which give rise to an acute abdominal condition have been enumerated, it is safest in the majority of cases where definite right-sided pain, tenderness, temperature, vomiting and a certain amount of collapse is noted to presume that it is appendicitis and operate.

In the early weeks of amenorrhœa tubal gestation may simulate an attack of appendicitis but the characteristic history, the findings at vaginal examination, the size of the uterus and if necessary the exploration of the posterior cul de sac *per vaginam* by a hypodermic syringe will help to clarify the diagnosis.

Acute salpingitis undoubtedly simulates in some cases an appendicular colic. Leucocytosis and fever will be present but very rarely nausea and vomiting. A history of painful micturition with burning sensation and actual vaginal discharge is most suggestive and a careful microscopic examination of a smear may reveal the presence of the gonococci.

Twisted ovarian cyst does give rise to an acute pain associated with collapse but the pain is usually low in the abdomen, abrupt in its onset and associated with vomiting. There may be no elevation of temperature and a careful bimanual examination will reveal the presence of a cystic swelling to one side or the other.

Pyelitis on the right side is a common complication of pregnancy and it may often be very difficult to differentiate it from appendicitis. It occurs most commonly between the fifth and seventh months and is commoner in primiparae. It is frequently ushered in by a chill associated with high temperature and pain both in front and back. An examination of the urine may reveal the presence of pus. The rigidity is usually less marked and may sometimes be absent but repeated chills with a hectic temperature and tenderness in the costovertebral angle suggest the possibilities of this condition.

In **renal colic** the onset is usually severe and abrupt and if the urine be examined presence of blood may be demonstrated macroscopically and microscopically. The radiating nature of the pain is also suggestive and a roentgenogram will be of considerable help in revealing the presence of stone.

Intestinal obstruction involving the small bowel may sometimes offer some difficulty in diagnosis. It should however be recognised that obstruction may be the result of the appendicular attack itself. The pain of intestinal obstruction is typical.

Pernicious vomiting of pregnancy or hyperemesis occurs generally in the early months of pregnancy and is not associated with characteristic pain or elevation of temperature. It should generally present no difficulty in diagnosis.

Perforated gastric ulcer is sometimes confusing but the previous history of the case the pain rigidity and tenderness in the upper part of the abdomen will help in differentiating the condition.

Biliary colic or the pain produced by cholecystitis may be confusing especially if the gall bladder lies low. The pain tenderness and rigidity are usually above the level of the umbilicus and in some cases it may be possible to palpate the gall bladder and define the area of tenderness.

Diverticulitis especially if it be in the sigmoid may be misleading.

Whatever may be the nature of the condition it should be realised that in the majority of cases early operation offers the best chance of recovery. The pain of appendicular colic may be located in varying places and may radiate differently depending upon the situation of the appendix and the direction in which it is pointing.

When there is a history of a previous attack of appendicitis in a pregnant woman prompt surgical intervention is warranted as a prophylactic measure. It is always desirable to remove the appendix after any history of such an attack in a woman in the child bearing period.

In the later weeks of pregnancy the presence of the enlarged uterus makes it a little more difficult to expose the appendix.

satisfactorily and in some cases it may be necessary to empty the uterus before tackling the appendix. On the other hand in the majority of cases there should be no difficulty to get at the appendix by suitably tilting the uterus to one side after opening the abdomen. The uterus should be manipulated as little as possible and the sooner the operation is finished the better would be the prognosis.

So far as the termination of pregnancy is concerned in the presence of suppuration in the appendix it is not desirable to empty the uterus and in the majority of cases efficient drainage will prove sufficient. Later the uterus may empty itself through the natural passages.

CHAPTER XXI

DISEASES AND ABNORMALITIES OF THE OVUM

UNDER this heading will be considered the following conditions pertaining to the foetus, membranes and placenta —

- (1) Diseases of the chorion.
- (2) Diseases of the amnion
- (3) Diseases and anomalies of the placenta
- (4) Diseases and anomalies of the umbilical cord
- (5) Diseases of the foetus
- (6) Anomalies in the development of the foetus

Diseases of the Chorion

HYDATIDIFORM MOLE

Hydatidiform mole otherwise known as vesicular mole is due to the degeneration of the chorionic villi resulting in the death of the foetus and the conversion of the chorionic villi into a large number of vesicles varying in size from a small pea to a big sized grape. They resemble the hydatid cysts and hence the name hydatidiform mole or vesicular mole.

Frequency This condition is by no means rare. At the Government Hospital for Women and Children Madras there were 35 cases of hydatidiform mole among 20420 cases of labour giving a proportion of 1 in 583. It is more frequent in multiparae than in primiparae and generally occurs in the early part of pregnancy between the eighth and twelfth weeks rarely after the sixteenth week. In the majority of cases the foetus dies and no remnant of it can be found later but a few cases are on record where a dead foetus has been found in association with a degenerated condition of the chorion.

Another fact sometimes noted is that the ovaries undergo a peculiar form of polycystic degeneration. These cysts are generally lutein cysts ; it is not known what conditions favour the formation of lutein cysts as they are not invariably present in all cases of hydatidiform mole.

Signs and Symptoms. In the early weeks there may be nothing to call attention to the fact that a degenerative process has started, but with the gradual advancement of the pregnancy three important signs appear which are characteristic of this peculiar condition.



FIG. 66.—Uterus with a vesicular mole showing also lutein cysts of the ovaries.

(1) The enlargement of the uterus is out of all proportion to the period of amenorrhœa ; thus, with a woman giving a history of ten to twelve weeks of amenorrhœa, the height of the enlarged uterus on palpation may be found to be midway between the umbilicus and the symphysis, or even as high as the umbilicus.

(2) Vaginal hæmorrhage occurs at intervals in an irregular manner, sometimes profuse, sometimes scanty. But more important than the hæmorrhage is the serosanguineous discharge which persists for some time. If the discharge be carefully examined it is possible that small vesicles may be present, or a small piece of tissue may be passed, with some vesicles, which appears like a red currant jelly with white currants interspersed in it.

(3) On palpation the uterus has a doughy feel and no outline of the foetus can be made out. Auscultation does not reveal the presence of the foetal heart sounds.

Reflex symptoms that may occur in this condition are excessive nausea, vomiting, faintness, occasional attacks of syncope and vague abdominal discomfort. In a minority of cases albuminuria may be present. In those cases where the vesicular mole takes on a malignant activity and extends through the uterine wall into the peritoneum the signs and symptoms characteristic of the malignant condition, chorion epithelioma, may be present. In a few cases where the degeneration has occurred in the later weeks of pregnancy the whole of the placenta is not involved and consequently the foetus may continue to live. Cases have been recorded where the foetus has continued to live up to full term and in one of our cases premature labour at the thirty second week resulted in a live birth and the passage of a placenta, part of which was the seat of hydatid degeneration.

Diagnosis. The passage of the cysts *per vaginam* is pathognomonic of this condition. Their presence can sometimes be made out by vaginal examination. The main points in the diagnosis are the excessive size of the uterus, the absence of any definite foetal parts and of the foetal heart, the doughy feel of the uterus together with the history of irregular bleeding or serosanguineous discharge *per vaginam* and the passage of the characteristic vesicles.

A roentgenogram is helpful in demonstrating the absence of foetal parts.

In cases of doubt an Aschheim Zondek or Friedman's test will throw considerable light as the test is always positive and stronger than in normal pregnancy. In the rare cases however where the vesicular mole is blasted or has ceased to grow and is therefore dead for some time, the test may be negative. If bilateral lutein cysts can be palpated on bimanual examination it will aid in the diagnosis. Where metastatic growths have occurred as in the vagina not only may the diagnosis of a vesicular mole be made out but the possibility of its having taken on a malignant character may also be inferred. The uterus may not always be bigger than normal in a vesicular mole for in the conditions where the mole has ceased to grow retrogressive changes may take place resulting in the gradual shrinkage of the organ so that a stage may be reached when it may not be disproportionate to the period of amenorrhoea or in extreme cases it may occasionally be smaller than the period of amenorrhoea would indicate. A careful consideration of the history together with a bimanual examination may throw some light otherwise evacuation of the uterus will settle the diagnosis and relieve the condition.

A rare mistake that may occasionally be made is to confuse this condition with placenta previa or accidental haemorrhage

Occasionally the condition may be mistaken for hydramnios. This is more likely to occur in those cases where the haemorrhage resulting from the hydatidiform mole is retained in the uterus. Even so the uterus is not tense or cystic and a vaginal examination will reveal no tense bag of membranes presenting. It is more difficult to distinguish between concealed accidental haemorrhage with a normal pregnancy and concealed haemorrhage occurring in a case of vesicular mole. The diagnosis may be cleared up only when an attempt is made to rupture the membranes when it will be found that while in a normal pregnancy with concealed accidental haemorrhage the membranes may be ruptured there is no possibility of rupturing the membranes in vesicular mole associated with concealed haemorrhage.

Prognosis The prognosis of this condition is serious on account of the many risks to which the patient is liable. The chief of these are haemorrhage, sepsis, perforation of the uterus and the development of a malignant tumour later. The more advanced the period of pregnancy the graver is the prognosis as the haemorrhage in such cases is more severe. Continual loss of blood may render the patient so anæmic that she may not be able to stand evacuation of the uterus. The general health of the patient is also considerably vitiated by the other complications such as nausea, vomiting, presence of albuminuria etc. If the patient comes under observation early after the onset of symptoms and the uterus is evacuated with care and the patient is kept under continuous observation for a period extending to two years the prognosis may not be unfavourable.

Treatment Once the diagnosis of hydatidiform mole has been made the only proper treatment is to empty the uterus as early as possible. Delay in resorting to this step may sometimes lead to disaster as the patient may have a sudden attack of severe bleeding which may so lower her vitality that the further steps necessary for completing the evacuation of the uterus may be hazardous. In some cases the patient may come with bleeding the os sufficiently dilated and a portion of the vesicular content projecting or partially expelled. In such cases if the condition of the patient is satisfactory a hot douche should be given and under light anaesthesia the os is sufficiently dilated to allow at least two fingers to be introduced and the whole of the vesicular contents is separated from the uterine wall and then by bimanually compressing the uterus with the hand on the abdomen the molar mass is expressed. The patient should be given an injection of pituitary extract and ergotin and any degree of collapse treated.

We do not advocate the use of the curette in this condition as the only curette that is satisfactory and safe is the finger. The probabilities of perforation of the uterus with any instrumental curette are so great and the chances of removing the vesicular contents effectively by curettage with instruments so remote that it should never be done at any rate as a preliminary step in evacuation of the uterus for this condition.

A hot intra uterine douche may in some cases be given after evacuation to allow the remnants of the vesicular contents being washed out.

When, however, the patient comes with a certain amount of hæmorrhage and the cervix is closed the more satisfactory method of evacuation is by abdominal or vaginal hysterotomy. If there is no evidence of sepsis we prefer the abdominal route for the following reasons: the uterus can be opened into and satisfactorily evacuated; the condition of the uterine musculature and of the endometrium can be examined thoroughly to find out if there has been any attempt at invasion of these structures by the vesicles. If there is any suspicion that invasion has occurred it is better to perform a hysterectomy for fear that later malignant changes may take place.

It is our experience that where the cysts are very small the chances of invasion of the endometrium and the uterine wall are greater, and hence the possibility of malignancy is more than in cases where the cysts are large grape like and are easily separable from the uterus. One should not hesitate if there is considerable amount of difficulty in separation of the vesicular contents owing to the close attachment of the vesicles to the endometrium and muscular wall to resort to hysterectomy in such cases. The disadvantage is that the uterus is sacrificed and another chance of conception is rendered impossible. An alternative suggestion for this will be given later.

The vaginal route method of hysterotomy is to be preferred if there is any chance of a septic infection. Whatever the method of evacuation adopted where the uterus is left *in situ* the patient should be cautioned to seek immediate assistance if there is a recurrence of hæmorrhage and certainly to come in for examination after six to eight weeks. In some cases bleeding recurs a week or so later owing to the imperfect evacuation of the uterus. In such cases a secondary curettage may be necessary and under such circumstances one may be justified in using the large blunt flushing curette to ensure complete evacuation. At the periodical examinations necessary after evacuation of a hydatid mole the Aschheim Zondek test is done to see if it is positive. Frequently one can state from this test that a case is going on to the stage of chorion epithelioma, so this most helpful method of settling a grave issue

should never be lost sight of. A positive result means the presence of living chorionic tissue.

In cases where the uterus has to be conserved and there is a suspicion of the possibility of a malignant degeneration beginning, a method of treatment that can sometimes be adopted is to give radium therapy six to eight weeks later (30 mgms of radium introduced into the uterine cavity for twenty four hours is a safe dosage). As has been already stated, patients who have had vesicular mole removed must be carefully watched for a period extending to two years and on the appearance of any symptoms or signs suggestive of chorion-epithelioma suitable methods of treatment should be adopted which will be detailed later. The general health of the patient should be attended to and tonics, particularly hematinics, should be administered. It is wise for the patient not to risk pregnancy for some years after a vesicular mole has been passed.

In some cases where facilities are not available for performing hysterotomy or the conditions are not satisfactory for such operation a method of treatment that has been adopted when the cervix is not sufficiently dilated is as follows: the cervix is dilated by a few metallic dilators, the vesicular contents are stirred up, the cervical canal and the vagina tightly plugged and the patient given $\frac{1}{2}$ c c of pituitary extract and kept at rest. The pituitary extract is repeated at intervals of four to six hours, and it will be found after an interval of twelve to sixteen hours when the plugs are removed that cervical dilatation has progressed and that the vesicular mole is practically separated, the uterus is easily evacuated by the fingers passed through the dilated cervical canal and a hot intra uterine douche given thereafter. This method of evacuation at two stages where the cervix will not permit of evacuation at once helps to save the patient from the severe risks of hæmorrhage or lacerations of the cervix.

The bilateral lutein cysts which have been referred to generally shrink after evacuation of the uterus, and in those cases where an abdominal hysterotomy is performed it is unnecessary to

Pathology The tumour is generally in the uterine wall, and it is soft, intensely hæmorrhagic and variegated in colour. Metastasis occurs rapidly, particularly in the lungs, brain and the vagina. On microscopical examination the tumour is found to be made up almost entirely of broad, irregular and ragged anastomosing strands of the two types of chorionic epithelium—the one consisting of the Langhans' cells, smaller and more regular in form, with pale or almost clear protoplasm, while the syncytial cells form solid masses of protoplasm, staining more deeply in which numerous nuclei, often of large size, are embedded.

There are some features which are peculiar about these tumours. Even under normal conditions the chorionic epithelium tends to invade, while in the condition known as hydatidiform mole there is an exaggeration of the development of the villi, in chorion epitheliomata these changes take on more rapid increased activity. Another peculiarity is that chorion epitheliomata sometimes seem to retrogress and disappear completely. The presence of the lutein cysts in the ovary has given rise to the hypothesis that if there is a great overgrowth and excessive activity of the corpus luteum tissue it may produce excessive growth of the chorionic villi over which its secretion is supposed to have an effective control. On the other hand, it has been suggested that the excessive growth of the chorion requires the development of the additional corpus luteum tissue. It is by no means settled what is the cause and what the effect.

Symptoms Repeated uterine hæmorrhage following abortion, full time labour or hydatidiform mole particularly if persisting should always arouse the suspicion of a chorion epithelioma. The bleeding may be due to remnants of the mole being left behind or to a piece of placenta, or to a placental polypus. In these conditions, however, simple curettage will generally cure the condition whereas, in cases of chorion epithelioma, the bleeding is not controlled and may become worse. Examination of the uterine scrapings microscopically will reveal the presence of malignancy. The patient is generally anæmic and complains of pain in the lower part of the abdomen. Where secondary deposits have occurred other symptoms may follow. Secondary deposits in the lungs generally give rise to pulmonary symptoms such as pain, blood stained sputum and a persistent cough.

On bimanual examination the enlarged uterus distended by the tumour, may be felt. In some cases, where the growths have spread to the vagina, they may be easily made out and they will be found to bleed readily on examination.

Prognosis The prognosis is grave, but if the patient is subjected to treatment at an early stage the prognosis is very much improved. Death may result from hæmorrhage, cachexia, secondary

infection perforation of the uterus with peritonitis or secondary metastasis affecting the lungs liver brain etc

Diagnosis Repeated hæmorrhages after abortion or full time delivery should be looked upon with considerable suspicion. If curettage does not control the hæmorrhage or if the microscopical examination of the scrapings reveals the presence of the malignant growth the diagnosis is obvious. Vaginal metastasis may also help in the diagnosis.

The Aschheim Zondek test is of considerable importance as in these conditions it persists for a long time and can be obtained even with high dilutions of the urine thus demonstrating the presence of very large quantities of the anterior pituitary like hormone in the urine. If the Aschheim Zondek test has been negative for some time after the expulsion of the vesicular mole and again becomes positive in the absence of any signs of pregnancy the diagnosis of a chorion epithelioma is absolute.

Treatment In all cases where the condition is operable a complete removal of the uterus and its appendages together with such metastatic growths as can be removed has been advised. Where metastatic growths are present in the lungs or in other structures not within reach of operative technique deep X ray therapy is of great value. Once the uterine tumour has been removed there is a tendency for the secondary deposits to disappear.

An alternative method of treatment which is being tried with satisfactory results in early cases is the use of radium and X ray for this condition. Fifty mgms of radium may be applied for forty-eight hours repeated if necessary after an interval of two or three weeks. The patient should be continuously under observation after this method of treatment for at least a year. Deep X ray therapy may supplement the use of radium under these circumstances.

Diseases of the Amnion

HYDRAMNIOS

By this term is meant the condition where there is an excessive quantity of liquor amni present in the gravid uterus. The normal amount of liquor amni present ranges between 2 to 5 pints. Anything in excess of this constitutes hydramnios. There may be considerable variations in the quantity of liquor amni present in a case of hydramnios and as much as 40 to 50 pints have been met with.

Ætiology The ætiology of this condition is still obscure. The excess of liquor amni may be derived from several sources. It may be from the amniotic membrane itself or it may be from the fœtus or the mother. Hydramnios is not infrequently associated

with plural births or foetal abnormalities. Anencephaly, spina bifida, and several other deformities of the foetus such as talipes, ectopia vesicæ, congenital cystic kidneys, etc., are found. In some cases the condition may be the result of some obstruction in the foetal circulation, either in the umbilical cord or within the foetus. A factor which may have some bearing is the possibility of an excessive urinary secretion resulting from some damage to the kidneys or the heart of the foetus.

Diseased conditions of the mother involving secondary disturbances may lead to a diseased condition of the placenta with increased transudation into the amniotic cavity. Thus, in cardiac and renal affections œdema of the placenta may occur and a greater amount of fluid may pass into the amniotic cavity.

Syphilis may have a bearing in some cases, particularly when the viscera are affected.

Symptoms. There are two types of hydramnios, chronic and acute.

The symptoms of chronic hydramnios are largely those produced by mechanical factors as a result of the increased pressure exerted by the over-distended uterus upon the adjacent viscera and structures in the abdomen. Thus the pressure effects may be felt



FIG. 67.—Hydramnios

by the lungs, the heart, kidneys, intestines, bladder, nerves and veins. In consequence thereof the patient may complain of respiratory embarrassment due to pressure upon the diaphragm and the lungs. Attacks of precordial pain, palpitation, cyanosis and dyspnoea may result from pressure upon the heart in association with pressure upon the lungs. Pressure on the kidneys may result in diminution in the quantity of urine passed, pressure on the stomach and intestines may result in indigestion and constipation, pressure on the veins may cause œdema of the extremities, pressure on the nerves may give rise to pain in the lower extremities and neuralgia. Even with a fairly large quantity of liquor amni the condition, if it is chronic, does not in many cases give rise to any severe symptoms of distress.

On the other hand, in acute cases the symptoms of distress are more in evidence, obviously due to the fact that the patient has

not been able to adjust herself to the sudden and severe distension and the pressure caused thereby. Apart from the mechanical effects of pressure acute hydramnios may give rise to a certain amount of shock and also cause severe pain from the sudden stretching of the uterine musculature and its peritoneal investment.

Hydramnios can occur at any time during pregnancy. If prolonged it may lead to emaciation, slight elevation of temperature, nausea and vomiting and signs suggestive of toxæmia.

Acute hydramnios usually occurs about the fifth or sixth month of gestation and may in some cases lead to premature termination of pregnancy.

Diagnosis. The enlargement of the uterus, which is out of proportion to the period of pregnancy, the tense cystic condition of the uterus on palpation, together with a fluid thrill and the easy ballottement of the fœtus, will indicate the diagnosis.

Hydramnios has to be differentiated from —

- (a) Multiple pregnancy
- (b) Ovarian cyst complicating pregnancy.
- (c) Ascites
- (d) Concealed accidental hæmorrhage

The differential diagnosis is easy provided a careful examination is made.

In multiple pregnancy the uterus is never tense and very numerous foetal small parts are easily palpable, except in those cases where multiple pregnancy exists in association with hydramnios. Their differentiation without the aid of X rays is practically impossible, and it can only be surmised that in addition to the hydramnios multiple pregnancy may also be present. The foetal heart is not easily audible in cases of hydramnios, but in uncomplicated cases of multiple pregnancy without hydramnios the foetal heart is distinctly heard—indeed two can sometimes be detected—foetal parts are easily felt and the uterus itself is lax.

Ovarian cysts may give rise to a great deal of abdominal enlargement if associated with pregnancy. A careful examination will reveal the presence of foetal parts and the cystic tumour separate from the uterus. An X ray examination is of considerable value in some cases.

In cases of pregnancy complicated with ascites, characteristic shifting dullness may be demonstrated. A bimanual examination will probably reveal the fact that the uterus itself is not involved and that there is no undue tenseness of the fluid within its cavity.

Concealed accidental hæmorrhage may sometimes be mistaken for acute hydramnios. In both cases there is a sudden acute

distension of the uterus associated with more or less severe pain and signs of shock. But in concealed accidental hæmorrhage the secondary signs of hæmorrhage are manifest whereas in cases of acute hydramnios no signs of hæmorrhagic collapse will be present. Moreover signs of a more or less severe albuminuric toxæmia of pregnancy are often present in cases of concealed accidental hæmorrhage but in cases of acute hydramnios they are generally absent or only slightly marked.

Complications Complications in a case of hydramnios may occur either during pregnancy or at the different stages of labour.

During Pregnancy As a result of pressure effects dyspnoea cyanosis precordial pain palpitation of the heart œdema and neuritis may necessitate an early termination of pregnancy.

During Labour—First Stage Weak uterine contractions—primary uterine inertia. Premature rupture of the membranes. Presentation of the cord. Malpresentations and malpositions.

Second Stage Prolonged labour. Uterine inertia. Prolapse of the cord. Ablatio placentæ.

Third Stage Retained placenta. Postpartum hæmorrhage.

Prognosis It will thus be seen that the prognosis in cases of hydramnios is unfavourable both for the mother and the child. To the mother the risks incidental to excessive pressure the complications in the three stages of labour particularly those which may result from malpresentations and postpartum hæmorrhage add to the dangers.

So far as the fœtus is concerned apart from the possibility of abnormalities and deformities malpresentations prolapse of the cord prolonged labour weak uterine contractions and the necessity for interference together with the fact that labour is often premature make the fatal prognosis very unfavourable.

Treatment Minor grades of hydramnios may not require any treatment and it is not infrequent that in such cases labour comes on prematurely and terminates spontaneously without undue risks to mother or fœtus. The general health of the patient must be attended to the bowels must be kept open the patient rested and every care taken to see that the kidneys function properly. On the other hand in the severe degrees of hydramnios where the uterus is much distended and respiratory or cardiac distress is present pregnancy may have to be terminated irrespective of the period of gestation.

Where pregnancy is to be terminated on account of the distressing symptoms caused by excessive pressure rupture of the membranes is the method to be employed. If the woman is in labour it is again desirable to rupture the membranes artificially because if the tense bag of membranes be allowed to dilate the

cervix rupture will take place prematurely, but at the most dependent part of the bag of membranes and result in the escape of a large quantity of liquor amni. Such a large gush of water escaping suddenly may lead to one or more of the following complications —

- (1) The cord may be washed out in front of the presenting part with the first gush of the fluid
- (2) The force with which the fluid escapes may promote a malpresentation or malposition
- (3) The sudden relief of tension may produce a negative pressure, which favours separation of the placenta and thus cause accidental hæmorrhage
- (4) The sudden relief of tension may also give rise to a degree of shock.

For these reasons when the patient is in labour it is better artificially to rupture the membranes sufficiently high up so as to allow the fluid to drain off under control and to see that only a limited amount of liquor amni escapes. When the cervix is dilated to admit one finger this is done by carefully passing a male metal catheter between the membranes and the uterine wall as high up as possible but not so as to impinge upon the placenta. Then by sharply tapping the amniotic sac as much of the fluid is allowed to escape through the catheter as is necessary for the relief of tension. When the membranes are ruptured high up in this manner the bag of membranes is still preserved, a sufficiency of liquor amni is left behind in the uterus, no sudden emptying of the uterus occurs and while a certain amount of liquor amni may continue to escape through the valvular opening thus made as more frequent uterine contractions develop a uniform dilatation of the cervix is possible and a more natural course of delivery rendered probable.

Another great advantage is that if the labour progresses along such lines the chances of postpartum hæmorrhage are reduced because the uterine musculature has had time to regain its tonus. Postpartum hæmorrhage is much more likely to occur in those cases where the uterus empties itself suddenly, as sometimes occurs with a premature fœtus soon after rupture of the membranes.

Where labour is induced on account of pressure symptoms a similar method of induction may be adopted namely, high rupture of the membranes by passing a catheter.

A method that has recently come into vogue and has been successfully adopted is tapping the fluid through the abdominal wall. It has the advantage that if successful the possibilities of rupture of the membranes in the most dependent part during the

attempt to pass the catheter are avoided. The following case illustrates the point —

A sixth para was admitted with severe pressure symptoms due to chronic hydramnios of some weeks duration. The abdomen was very much distended and as the patient was subject to severe respiratory embarrassment it was decided to tap the amniotic sac through the abdominal wall by passing a trocar and cannula. After taking the usual precautions to avoid the bladder and the placental site the trocar was passed with strict aseptic precautions through the abdominal wall into the uterine cavity. 16 pints of amniotic fluid were allowed to drain off the trocar was removed and the puncture sealed with collodion. The patient was immediately relieved of much of the respiratory embarrassment. Thirty six hours later uterine contractions started and six hours after commencement of the pains the cervix was fully dilated a fair sized bag of membranes was present which on rupture was followed by the birth of a premature live foetus weighing $\frac{1}{2}$ lbs. The third stage was uncomplicated and the convalescence was uneventful.

In every case of hydramnios precautions must be taken to treat the condition of postpartum hæmorrhage should it supervene. For this reason special care must be taken if adopting any operative methods of delivery particularly if the woman is submitted to an anæsthetic. It is much safer to allow labour to terminate spontaneously and to avoid using an anæsthetic.

OLIGOHYDRAMNIOS

Oligohydramnios otherwise known as oligamnios is a condition associated with a decrease in the amount of liquor amni and is somewhat rare. The total amount of liquor amni may be only a few ounces. The result of this diminution in the quantity of liquor amni is to permit of adhesions developing between the membranes and the foetus. Deformities of the foetus such as encephalocele anencephalus club foot drop wrist amputation of the extremities or fingers ankylosis of joints etc. are common. Some of these defects are due to the cramped space in which the foetus has to develop others are due to amniotic adhesions encircling a part of the foetus and thus compressing it.

The ætiology of this condition is not known.

When labour begins the uterine contractions may be painful and weak and the first stage is thus protracted. The placenta may sometimes be prematurely separated. Labour is not infrequently premature and may have to be terminated by artificial assistance. Owing to deficiency of liquor amni the foetus may show signs of distress even before rupture of membranes.

Anomalies and Diseases of the Placenta

Anomalies of the placenta which occur may be classified according to the size, form, number, relationship and method of insertion

ANOMALIES IN SIZE

The normal weight of the placenta is about 1 lb and the ratio of the weight of placenta to the foetus is as 1 : 6. In some cases the placenta is very much smaller and this may lead to arrest in the development of the foetus. In other cases the placenta may be hypertrophied occasionally the weight being as much as 2 lbs. Under such circumstances there is a tendency for the foetus to be much larger. A relative increase in the weight of the placenta as compared with the foetus may occur in certain diseased conditions such as syphilis, albuminuria and diabetes.

Placenta Membranacea In this condition the placenta extends over the greater portion or even the whole of the chorionic surface, and the increase in area results in the formation of a thin and membranaceous placenta. As a result of this larger placenta covering a greater surface area of the uterine cavity the placenta tends to become *prævia* which gives rise to antepartum hæmorrhage. There is a tendency in the third stage of labour for the placenta to be retained or even be adherent, and this causes postpartum hæmorrhage. This is fortunately a rare form of abnormality but when it does occur manual removal of the placenta may be necessary.

ANOMALIES IN FORM

Among these may be mentioned —

(1) **Lobate Placenta** (or multiple placenta in single pregnancy) In this condition the placenta is divided into two or more lobes and in some cases as many as seven lobes may be present. Depending upon the number of lobes the placenta is known as bipartite tripartite etc.

In this condition there is a single cord attached to the placenta which divides into its constituent elements and the vessels from each one of these lobes finally unite to form the umbilical vessels.

(2) **Placenta Fenestrata** This condition is characterised by one or more solutions of continuity in the substance of the placenta, through which the chorion is visible.

(3) **Horse-shoe Placenta** Occasionally the placenta is kidney shaped when it is known as a horse shoe placenta.

In all these anomalies difficulty may arise in the third stage of labour through partial detachment of the placenta and consequent postpartum hæmorrhage

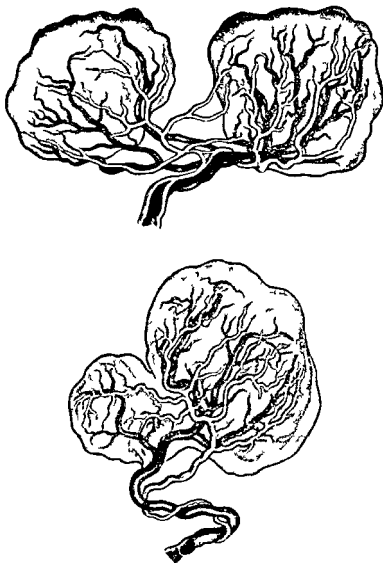


FIG. 68.—Placenta bipartite

ANOMALIES IN NUMBERS

Sometimes there are supernumerary or accessory placentæ. The commonest form of this anomaly is that known as *placenta succenturiata*. As many as half a dozen of these succenturiate lobes may be found within a single uterus

In the third stage of labour the succenturiate lobe may be retained within the uterus, causing postpartum hemorrhage either primary or secondary. Sepsis may also result and later the succenturiate lobe may give rise to the formation of a placental polypus, causing free and prolonged hemorrhage. The condition should be looked for and a careful examination of the placenta and membranes after they have been expelled will always help in diagnosing it. Where a succenturiate lobe is retained within the uterus, an examination of the membranes will reveal a small round area of deficiency a short distance from the placental margin,

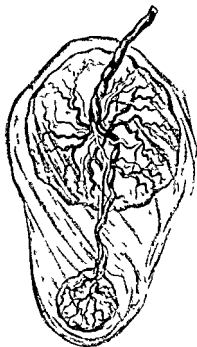


FIG 69 — Placenta succenturiata

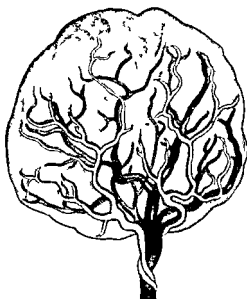


FIG 70 — Battledore placenta

and if it is also noted that torn vessels are present extending from the placenta to the margin of the tear in the membranes the diagnosis becomes certain.

ANOMALIES OF RELATIONSHIP

In this condition there are anomalies of relationship between the placenta and the membranes or the cord. Among the varieties that may be met with are —

(a) "Battledore" Placenta. This term is applied to a placenta in which the cord is attached to the margin of the placenta.

(b) Placenta Marginata or Placenta Circumvallata. Here the chorion is attached, not at the border of the placenta but within

the placenta itself a little distance from its margin so that a portion of the placenta is present beyond the attachment of the membranes

The clinical significance of these placental anomalies is twofold —

(1) The amnion and chorion may be found intimately adherent so that when the after birth is expelled portions of the membrane may be left behind

(2) Incomplete detachment retention of the placenta and atonic postpartum hæmorrhage are frequently encountered

ANOMALIES OF INSERTION

Placenta Prævia We have referred to this condition in the chapter on antepartum hæmorrhages. The normal insertion of the placenta is more or less fundal. When the placenta is wholly or partially situated in the lower uterine segment the condition is known as *placenta prævia*

Diseases of the Placenta

Various diseased conditions may be noted in the placenta in some of which the nature and extent of the disease may unfavourably affect the fœtus. Chief among these diseased conditions are —

(1) **Infarct Formation** This is the most frequent abnormality of the placenta and is generally found in conditions associated with increased arterial tension or venous congestion for example in chronic nephritis and the toxæmias of pregnancy. Cardiac disease and syphilis are also factors which may tend to cause placental infarction

There are no clinical symptoms characteristic of this condition. If it occurs in the first half of pregnancy abortion is likely to result

(2) **Placentitis** Inflammation of the placenta may occur although somewhat rarely. It may be either acute or chronic. The inflammation is generally not a primary condition but may be due to extension of infection from the decidua due to an exacerbation of a pre-existing disease for example chronic gonorrhœa or any infective process of a pyogenic nature. In some specific infectious diseases also inflammation of the placenta may occur. Placentitis may sometimes be set up as a result of albuminuria particularly if other factors are also present

Two diseases which may involve the placenta are tuberculosis and syphilis. In tubercular infection of the placenta caseating tubercles may be scattered chiefly in the decidua and rarely in the villi. This is extremely rare and it would appear as though the placenta is almost immune to Koch's bacillus

Syphilis is by no means infrequent and is the commonest cause of foetal death. The syphilitic placenta is usually large, thick and lighter in colour than normal. Its weight is proportionately increased and may be one third to one fourth the weight of the foetus. It is impossible to make any accurate diagnosis of syphilitic placentitis during pregnancy. Besides the risks to the foetus the maternal risks are due to the presence of adherent placenta and subsequent possibilities of sepsis. With the modern methods of antisyphilitic treatment available the prognosis is considerably better if the condition is treated in time.

Among other degenerative changes may be mentioned cystic degeneration, calcareous degeneration, fatty degeneration and occasionally hyaline degeneration. In calcareous degeneration there may be small calcareous nodules on the maternal surface of the placenta and occasionally they may be so abundant as to give the sensation of feeling a coarse sand paper when the finger is passed over the area.

Placenta Accreta or Increta. This is a very rare form of adherent placenta and is the result of imperfect development of the decidua or excessive proliferation of the chorionic epithelium so that the villi invade the underlying musculature and even occasionally perforate through the uterus reaching the peritoneal surface. There is no line of cleavage between the musculature of the uterus and the placental tissue and their separation is impossible either naturally or artificially. The condition has been referred to in detail under postpartum hæmorrhage.

Anomalies of the Umbilical Cord

(1) **Length.** The normal length of the umbilical cord is about 20 to 30 ins. but great variations may occur. It may be very short or abnormally long. Variations between 5 and 40 ins. have been observed. In one case within our experience there was no umbilical cord the placenta being directly attached to the surface of the liver in a case of exomphalos. *Short cord* may give rise to dystocia for two reasons: it may arrest the descent of the foetus and it may by pulling the placental site cause reflex inhibition of proper uterine contractions. Occasionally it may lead to premature separation of the placenta or favour inversion of the uterus.

An unduly *long cord* may give rise to the following complications —

- (1) Presentation and prolapse of the cord
- (2) Knots and twists of the cord
- (3) Cord round the neck or the body several times

These anomalies may interfere with the foetal circulation and sometimes cause foetal death

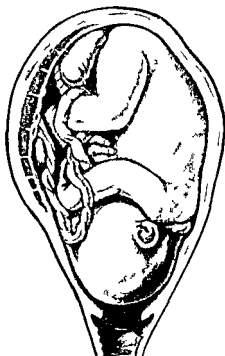


FIG 71 —Cord round the neck

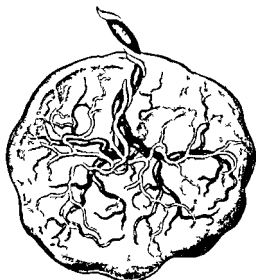


FIG 72 —Normal placenta with almost central insertion of cord

When the cord is round the neck several times it not only tends to strangle the foetus but also cause deflexion attitudes in

some cases and occasionally the relative length of the cord may be so seriously diminished that it may interfere with labour just as a short cord would

(2) **Insertion of the Cord** The normal insertion of the cord is more or less near the centre of the placenta, but in some cases the cord may be inserted to the margin of the placenta. This is known as a *"battledore" placenta*. In other cases the insertion may be into the membranes and not into the placenta. Here the vessels of the cord pass between the membranes for a greater or less distance

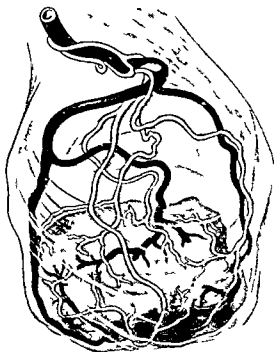


FIG. 73—Velamentous insertion of the cord

before reaching the placenta. This is known as a *velamentous* insertion of the cord. If this mesh of vessels happens to lie in the bag of membranes—*vasa previa*—rupture of the membranes may involve one of the vessels and so cause hæmorrhage and death of the fetus.

(3) **Knots of the Cord** These are formed generally in consequence of foetal movements. Knots may be either *true* or *false knots*. False knots are the result of a local increase of the Whartonian jelly. A true knot, on the other hand, is due to a loop in the cord through which the fetus has passed getting tighter and tighter. As a rule knots are harmless since the constriction is rarely tight enough completely to obliterate the lumen of the

vessels and thus obstruct the passage of blood. Where however, obstruction is caused it tends to interfere with the development of the foetus and may even cause death of the foetus

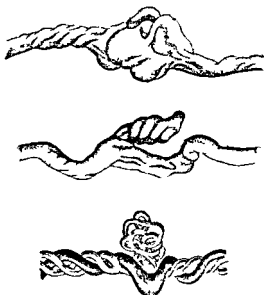


FIG. 74.—False knots in the cord

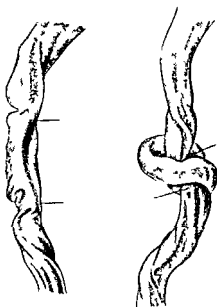


FIG. 75.—True knots

Among the other anomalies of the cord may be mentioned loops of the cord torsion of the cord where the cord becomes twisted and sometimes so seriously as to interfere with the

circulation inflammation of the cord tumours of the cord and anomalies of the vessels

These conditions are not possible of diagnosis nor is there any prophylactic or curative treatment possible where they give rise to serious symptoms

Diseases of the Fœtus

FœTAL SYPHILIS

Syphilis is one of the commonest causes of intra uterine death of the fœtus and the part played by this disease in the causation of abortion still birth macerated fœtus and neonatal death is fully dealt with in the chapter on diseases complicating pregnancy

Syphilis gives rise to characteristic lesions of the fœtus and it also affects the placenta In cases where the child is still born the spirochætæ can be demonstrated in the placenta and the liver kidneys adrenals and occasionally the lungs of the fœtus The syphilitic fœtus may be undersized and in some cases the skin covering the soles of the feet and the palms of the hand is thickened shiny and peels off easily The liver of the syphilitic fœtus is markedly increased in size and there is an increased tendency for interstitial fibrosis and small round cell infiltration The changes in the bones are also characteristic they are due to osteochondritis so that there is no sharply divided zone of preliminary calcification between the cartilage and the growing bone The bony lesions are widely diffused they occur at the epiphyses of the long bones as well as in the phalanges These bony changes are detected by means of X rays and this is therefore an accessory means of diagnosis in the intra uterine condition as well as in children born alive with a syphilitic infection

The changes in the placenta have been referred to The placenta may be larger and paler in colour relatively increased in weight in proportion to the fœtal weight so that it may be one fourth to one third instead of maintaining the usual proportion of 1 6 The maternal Wassermann reaction may be positive but it does not necessarily connote the existence of fœtal syphilis nor does a negative maternal Wassermann imply the absence of syphilis

INTRA UTERINE DEATH OF THE FœTUS

There are many causes which may give rise to intra uterine death of the fœtus chief of which are pregnancy toxæmias certain general diseases of the mother particularly acute infectious diseases syphilis and occasionally the anæmias and chronic nephritis Diabetes mellitus is responsible for the death of the fœtus in the later months of pregnancy Conditions associated with sudden

rise of temperature or high variations may also cause death of the fœtus. Apart from these causes there are certain cases where intra uterine death of the fœtus occurs without any apparent cause. Sometimes habitual death of the fœtus occurs at a particular period of pregnancy. It may be in the last trimester of pregnancy, or even at an earlier period. In a few of these cases diseases of the placenta may be noted subsequent to delivery.

Treatment Where a definite pathological entity can be ascertained this should be attended to. Syphilis renal disease, anæmia, toxæmias and intercurrent diseases should receive attention. In those cases where habitual death of the fœtus occurs at a particular period of pregnancy, the patient should be kept under observation, all possible precautions being taken in regard to diet, rest and normal habits. A method of treatment recommended in some of these cases is to give large doses of potassium chlorate, 10 grs. three times a day for a prolonged period, from the third month onward.

Where any definite deficiency, either in vitamins or endocrines, can be ascertained, this ought to be rectified. Vitamin E has been given in some cases with beneficial results. Deficiency of endocrines, particularly the thyroid should be dealt with. It is possibly in overcoming these three factors—vitamin deficiency, endocrine deficiency and deficiency of the hæmopoietic system—that the ultimate solution lies of preventing this unfortunate predisposition to habitual intra uterine death of the fœtus.

It was observed that in some cases a biochemical investigation of the blood constituents revealed the fact that while the blood urea, blood calcium and blood cholesterol were more or less normal there was a definite tendency for hypoglycæmia. On this basis glucose has been administered in large quantities. The subject requires further investigation.

A method of treatment that may occasionally be adopted is induction of premature labour, if the habitual death of the fœtus occurs after the thirty sixth week of pregnancy. This is a method in particular which may be recommended in cases of diabetes as *we have found in more than one case the tendency for death of the fœtus to occur in the last weeks of pregnancy*. This subject is referred to at greater length when considering diabetes complicating pregnancy.

Developmental Anomalies of the Fœtus

These anomalies may be restricted to a single fœtus or may involve two fœtuses. Anomalies of a single fœtus are more common. Among these may be mentioned anencephalus hydrocephalus, anomalies pertaining to the meninges spinal cord, various

anomalies of the thoracic and abdominal regions such as hydrothorax dextrocardia foetal ascites congenital cystic kidneys tumours of the liver, etc. Minor anomalies in regard to the extremities are not infrequent.

Among the more important of the anomalies from the obstetric point of view may be mentioned —

- (a) Anencephalus
- (b) Hydrocephalus
- (c) Foetal ascites congenital cystic kidneys, hydrothorax, etc

ANENCEPHALUS



FIG. 75a — Anencephalic Foetus

In this condition the head is imperfectly developed particularly the vault of the skull and the brain. Most of these foetuses are still born. A few may be born alive but die within a very short time. The brain is in a rudimentary condition, and owing to the absence of the cranial vault the base of the skull can be easily felt so that even the sella turcica may be distinguished. The foetus generally presents as a face presentation in view of the abnormal shape of the head.

The diagnosis can be made antenatally by a skiagram and by vaginal examination during labour.

Delivery is usually uncomplicated excepting for the fact that in many cases the shoulders are bigger than normal and may become impacted necessitating cleidotomy before delivery of the foetus is accomplished.

Hydramnios is not infrequently associated with this condition.

HYDROCEPHALUS

This is a condition where the ventricles of the brain are distended with an excessive amount of cerebro spinal fluid. Various degrees of hydrocephalus may be met with and in some cases the hydrocephalic head may fill the greater part of the uterus. The foetus may present either by the cephalic or the podalic pole. If cephalic the enlarged head distends the lower uterine segment.

The diagnosis of a hydrocephalus is not always easy, and the condition may not be recognised till the woman has been several

hours in labour. Careful palpation which fails to reveal a characteristic hard normally sized head may however put the obstetrician on guard particularly in those cases where the cephalic pole presents. When the cervix is dilated and a vaginal examination is made, the widely gaping sutures and the large fontanelles present a typical picture. Islands of bones in a sea of membranes tell their own tale. In breech presentations careful abdominal palpation may reveal the presence of the large ill defined and somewhat fluctuant head. In many cases however it is not till the breech is delivered up to the neck that the possibility of a hydrocephalus suggests itself because of the enlarged size of the uterus. The degree of the hardness felt above the symphysis together with difficulty in extracting the head.

Prognosis The foetal prognosis is bad. Frequently the foetus is delivered still born. Even when born alive its survival is a question of days. Cases of hydrocephalus develop a hopeless



FIG 75b —Hydro cephalus

form of idiocy and from every point of view the foetal prognosis is bad.

So far as the maternal prognosis is concerned much depends upon the treatment adopted. If a diagnosis is not made and improper treatment is resorted to or if the case is left to nature rupture of the uterus is inevitable and death of the mother will most probably result. But when adequate treatment is applied and the delivery is conducted in as conservative a manner as possible taking into consideration the fact that the foetal prognosis is hopeless there should be no increased risk of a pronounced nature to the mother.

Treatment When labour has begun and the cervix is sufficiently dilated two or three fingers breadth the head should be perforated. Immediately this is done a large amount of fluid gushes out and the skull collapses after which delivery may be left to natural efforts. If there is any necessity to accelerate labour the cranioclast may be applied and delivery completed. When the foetus is presenting by the breech a simple method of expediting delivery is to tap the spinal canal and so drain off the

fluid If the child has been delivered up to the neck, the head may be tapped through the base of the skull In some cases it has been suggested that tapping through the spinal column may be resorted to as a means of saving the life of the foetus How far this is a justifiable procedure in typical cases of hydrocephalus is a matter for serious doubt

Foetal Ascites, etc Enlargement of the body of the foetus due to fluid in the thorax or the abdominal cavity very often leads to difficulty in delivery The foetus in such cases usually presents by the breech and as soon as the lower extremities have been delivered and difficulty is encountered in the further delivery, a careful vaginal examination will reveal the tenseness of the abdominal cavity or of the thorax The question of the life of the foetus does not arise in such cases as the foetus is invariably dead or dying A trocar passed into the abdomen or thoracic cavity will



FIG. 75c.—Foetal Ascites

generally allow the fluid to drain away, and the rest of the delivery is fairly simple

In cases of hydrothorax the child may present by the cephalic pole and after the delivery of the head further progress is arrested It may be necessary to cut through the costal cartilages to obtain sufficient shrinkage of the body to enable the further delivery to take place

In cases where solid tumours or enlarged organs such as the liver obstruct delivery evisceration is necessary

DOUBLE MONSTERS

Double monsters or conjoint twins are of considerable interest both from the obstetrical and embryological points of view Different types of such monsters are met with ranging from two fully developed separate foetus joined together to monsters where the greater or lesser part of the anatomy is fused Various classifications have been adopted to differentiate the many varieties of

double monsters From a clinical point of view, however, double monsters may be —

- (a) Where both components are more or less of equal size and united in parts
- (b) Where one of the components is fully developed and has attached to it a portion of the second twin

From the obstetrical point of view the second of these categories does not cause any significant obstruction Fully developed double monsters however are a source of great difficulty in labour and



FIG 7ad —Thorac pagus

require considerable skill to effect their delivery without damage to the mother Such double monsters may be further classified into —

- (i) Those fused at the cephalic pole so that the fused heads present the appearance of a single large one These are called *syncephalic monsters* The majority of monsters are however *dicephalic* that is the two heads are separate
- (ii) *Thoracopagic monsters* In this category the two monsters are fused at the thorax The fusion may be limited to the thorax or may extend in part or whole to the abdominal cavity as well Thoracopagic monsters are *dicephalic* and depending upon the number of the upper and lower extremities they may be *dibrachius* *tribrachius* *tetrabrachius* and *dipus* *tripus* and *tetripus*

- (iii) A third category is the *ischiopagus* where the monsters are fused in the pelvic region. Many different varieties of such fusion may occur

Anatomical Features A careful dissection of these double monsters has revealed the presence of many anatomical abnormalities of an extraordinary nature which show how nature tries to circumvent the defects in her anxiety to regulate normal physiological action as far as possible. The circulatory system in particular is of special interest and it will be seen that there are many variations of the foetal heart ranging from a transversely elongated boat-shaped heart situated in the median line and enclosed in a single pericardial sac to two hearts fully developed united in the median line in the region of the auricles by a transverse sac. In consequence of this the arterial system also is complex. The aorta on either side may fuse again at the level of the last thoracic vertebra piercing the diaphragm and descending as the descending aorta once more to give off the necessary branches depending upon the number of the lower extremities. The diagrams show some of the complications of the circulatory system in such monsters.

The alimentary system also is of interest. In some cases there is fusion of the two stomachs from which a common intestinal tract proceeds. On the other hand the two stomachs may be entirely separate and the two duodenal canals may later fuse to form a single intestinal canal which bifurcates at the sigmoid end giving rise to separate anal openings.

In like manner the respiratory and the nervous systems are complicated.

Labour complicated by Double Monsters Of the many varieties of double monsters the dicephalic thoracopagi give rise to the greatest difficulty in labour. The diagnosis is not generally made antenatally unless an X-ray has been taken. More often such cases are mistaken for twins and it is only when the woman is actually in labour and there is difficulty that suspicion is first aroused as to the possibility of locked twins. A careful internal examination at this stage will probably reveal the true cause of the dystocia. There are however several authentic instances on record of thoracopagi where natural delivery has presumably occurred and the conjoint twins have survived in some cases for years. Sometimes both the component halves of the double monsters may present by the breech, the body which is fused may be delivered without much difficulty and then the first head enters the pelvis and is delivered by pulling the body well forward towards the mother's abdomen after which the second head usually finds its way out without much difficulty. More frequently however the delivery of the cephalic pole presents considerable

difficulty, and in such cases it may be necessary to decapitate one of the heads before the other can be delivered. After the delivery of the foetus the decapitated head can be expressed.

Cesarean section undoubtedly offers a safer method of delivery both for the mother and for the foetus and should be done in those cases where the diagnosis is made sufficiently early and the thoracic twins are fully developed.

In cases of syncephalic double monsters the difficulty is experienced in the delivery of the large head and may necessitate perforation before it can be expelled. In cases where the patient is first seen late in labour and the cause of obstruction is due to a double monster delivery may be attempted through the vaginal route by performing embryotomy. A safer method if difficulty is experienced is to deliver by the abdominal route and to perform a hysterectomy or to attempt exteriorisation of the uterus before effecting delivery.

CHAPTER XXII

ABORTION

By the term *abortion* is meant expulsion of the products of conception before the child is viable that is before the twenty eighth week of gestation. The word *miscarriage* used to refer to expulsion of the ovum after the placenta was fully formed that is after the twelfth week but before viability of the child and the term abortion was restricted to the period before the end of the third month. Abortion and miscarriage are now used synonymously. When the foetus is expelled after the twenty eighth week, but before full time *premature labour* is the term applied.

Causation. There are many causes that may directly or indirectly bring about an abortion. Some are more obvious than others. There are certain factors yet ill defined which seem to have a maternal bearing on the production of abortion. To these we shall refer a little later.

The causes may be classified into maternal foetal and paternal causes.

Maternal Causes. Among these are —

- (a) General causes and
- (b) Local or pelvic causes

The general causes include certain diseases such as —

(1) *Acute specific fevers* notably influenza pneumonia relapsing fever, acute exanthemata etc. It may be stated that abortion is more frequent in those types of fevers where the range of temperature

is high and where the fever is associated with conditions in the lungs producing a degree of cyanosis. The sudden elevation of temperature and the increasing venosity of the blood consequent on deficient oxygenation tend to bring about the death of the foetus and stimulate the uterus to action.

(b) *Syphilis* This is one of the commonest causes of abortion, particularly after the sixteenth week. It should, however, be stated that the tendency in such cases is for the patient to abort at a more advanced stage of each succeeding pregnancy till perhaps she is delivered of a macerated foetus at term, and then at a still later pregnancy of a live baby which shows signs of neonatal syphilitic infection. Rarely are cases of repeated abortion, occurring more or less at the same period of pregnancy, due to syphilis.

(c) *Toxæmias of Pregnancy* Chronic nephritis and certain toxæmias of pregnancy may bring about death of the foetus and favour abortion.

(d) *Poisons* Lead poisoning, in particular, and also mercury, arsenic and phosphorus poisoning may cause abortion.

(e) *Nervous Factors* Sudden shock, excessive fatigue or emotion may be responsible.

(f) *Diseases* such as tuberculosis, heart disease, diseases of the liver and lungs.

(g) Certain endocrine disturbances, such as those resulting from hypopituitarism, hypothyroidism, ovarian dysfunction and other conditions which are the result of deficiency of the sex hormones may bring about abortion.

(h) Lastly certain deficiency diseases caused by lack or deficiency of vitamins particularly vitamin E, are now recognised as possible factors.

Local Causes Among these are —

(a) *Inflammation of the Uterus* This may be either endometritis or a metritis, or occasionally a decidual endometritis. The inflammation prevents the formation of a normal decidua so that the ovum is denied its proper nourishment and chances of development. This results in the death of the embryo and consequent abortion.

(b) *Displacements of the Uterus* Retroversion and retroflexion play an important part in the causation of abortion. It is not merely by causing interference with the growth of the uterus that abortion results, but even in the early stages the chronic pelvic congestion and the associated changes in the endometrium consequent upon the backward displacement may lead to the death of the foetus and expulsion of the ovum.

(c) *Malformations of the uterus* and certain diseased conditions such as fibroids, polypi and lacerations of the cervix may all favour the occurrence of abortion.

(d) *Trauma* Abortion does not readily occur merely because of a traumatic factor. The large number of cases where pregnancy has not been interfered with even after a major surgical operation go to prove that abortion does not easily occur under such conditions. In some cases however where trauma results in rupture of the membranes or where other factors favourable for the cause of abortion are already present abortion is precipitated.

(e) Inflammations of the adnexa or of the pelvic cellular tissue may occasionally cause abortion.

(f) Lastly abortion may result from actual interference due to a therapeutic or criminal induction.

① **Fœtal Causes** Conditions which bring about death of the fœtus are certain to cause abortion. They are —

(a) Diseases of the chorion (hydatidiform degeneration) result in the death of the fœtus and degeneration of the chorionic villi and lead to the termination of pregnancy.

(b) Certain diseased conditions and abnormalities of the placenta such as syphilis, placental endarteritis, infarction and conditions which are commonly known in the later weeks of pregnancy as placenta previa and abruptio placente although not designated as such in the earlier weeks of pregnancy.

(c) Anomalies of the cord such as twists, knots and abnormal insertions may lead to death of the ovum and abortion.

(d) Diseases of the amnion. Hydramnios, oligohydramnios, amniotic adhesions etc. may likewise lead to death of the fœtus and the termination of pregnancy.

Besides these causes, malformations of the fœtus and certain diseased conditions of the mother which bring about death of the fœtus to which reference has already been made may favour abortion.

Paternal Causes Under this heading the commonest condition recognised as being responsible is syphilis. In some cases general debility may also be a factor in favouring abortion owing to weakness of the spermatozoa. The occurrence of an infective discharge may lead to the simultaneous infection of the uterus and thus favour septic abortion.

Habitual abortion is a condition where the termination of pregnancy occurs at about the same period in successive pregnancies. In some cases it may be between the twelfth and sixteenth weeks, in others it may be later, but in every such case the time at which abortion occurs is more or less the same. The cause of this distressing but extremely interesting phenomenon is not quite clear. It is possible that there are two factors responsible—an endocrine factor and a deficiency factor. So far all suggested methods have proved disappointing in the treatment of this condition.

Investigation of Causes In every case where abortion occurs a systematic investigation should be made to find out the cause. Besides a general examination of the patient to ascertain the presence of any constitutional diseases such as tuberculosis, syphilis, diseases of the kidney, or of the heart, or liver, a thorough hæmatological examination should also be made. A biochemical analysis of the blood is desirable to ascertain whether there is any particular factor such as deficiency of calcium. The urine should be tested for the presence of albumin, sugar and other abnormalities. The diet of the patient should be carefully investigated to find out any possible deficiency. An examination of the endocrine system is necessary to ascertain whether any appreciable evidence of one or other of the factors such as hypopituitarism or hypothyroidism is present. A neurological examination of the patient is also useful in certain conditions. After the general constitutional factors have been thoroughly investigated, an inquiry into the surroundings, the mode of life and the occupation should be made.

The local examination should include an investigation of the cervix, of the position of the uterus, the condition of the adnexa, the presence or otherwise of any discharge and the nature of such discharge.

A serological examination as well as an examination of any vaginal discharge should always be made.

At a later stage, after the abortion is over, it is desirable to curette the uterus and submit the curettings for a pathological examination.

No particular factor can be put down as positively the causative factor unless a thorough investigation is made on the lines suggested above.

Varieties The following varieties of abortion are recognised —

- | | |
|-------------------------|--------------------------|
| (1) Threatened abortion | (6) Missed abortion |
| (2) Inevitable abortion | (7) Febrile abortion. |
| (3) Complete abortion | (8) Therapeutic abortion |
| (4) Incomplete abortion | (9) Criminal abortion |
| (5) Cervical abortion | |

Signs and Symptoms The general signs and symptoms of abortion are —

- (1) Pain, due to uterine contractions
- (2) Hæmorrhage, the result of separation of the ovum
- (3) Dilatation of the cervix, due to the uterine contractions

The patient generally gives a history of amenorrhœa followed by more or less severe pain in the lower abdomen accompanied by vaginal bleeding. The extent of the hæmorrhage varies and may sometimes be so considerable as to cause severe collapse. Usually however the hæmorrhage continues for some days the quantity varying from day to day. The pain may be severe but is never so great as in cases of ruptured ectopic gestation. Where pain and hæmorrhage are present dilatation of the cervical canal occurs and occasionally a portion or the whole of the uterine contents is expelled. These are the general signs and symptoms of abortion. But there are some particular signs or symptoms which may be suggestive of the special variety of abortion. These will now be discussed in detail.

(1) *Threatened Abortion* In this condition after a period of amenorrhœa the patient complains of slight colicky pains in the lower abdomen associated perhaps with backache frequency of micturition and slight hæmorrhagic discharge *per vaginam*. If a careful bimanual examination is made the cervix will be found softened the uterus enlarged and more or less globular the size depending on the period of pregnancy. The os is generally closed or may in some cases be slightly dilated. Where there is no actual sign suggesting expulsion of a portion of the ovum the condition is best treated to begin with at least on the assumption that the case is one of threatened abortion.

(2) *Inevitable Abortion* This term denotes that the ovum has practically separated from the uterine wall and is therefore bound to be expelled. In such cases the pain is more severe the bleeding more profuse the cervix is dilated and occasionally a portion of the ovum may be felt protruding through the cervical canal.

(3) *Complete Abortion* This term is used when the whole of the ovum has been expelled. Once this has occurred the pain goes and bleeding decreases and may have stopped by the time the patient is seen. The uterus is empty and is accordingly smaller in size than the period of amenorrhœa would suggest it should be and the cervical canal may be closed as it contracts very rapidly after complete expulsion of the uterine contents.

(4) *Incomplete Abortion* When a portion only of the ovum has been expelled outside the uterus the condition is spoken of as incomplete abortion. In the early weeks before the full formation of the placenta the whole of the ovum is generally expelled entire. In some cases however a portion may become detached and is expelled the rest of it remaining within the uterus. After the formation of placenta the foetus may be expelled and the placenta retained in part or whole. In such cases the patient usually complains of periodic attacks of pain accompanied by a certain

amount of hæmorrhagic vaginal discharge. If what has been expelled from time to time is carefully preserved and examined it will be noted that the products of conception passed are not complete. A vaginal examination may reveal the presence of some portion of the ovum protruding through the dilated cervical canal. In other cases the uterus may still be found to be somewhat enlarged but the cervix is closed and there is blood on the examining finger. Where there is any doubt about the uterus being completely evacuated it is justifiable to explore the uterine cavity under *anæsthesia* after *preliminary dilatation of the cervix*.

(5) *Cervical Abortion*. This is a somewhat rare form and is due to the expulsion of the products of conception from the uterus into the cervical canal where they are retained because the external os remains closed. There is a certain amount of pain associated with hæmorrhage. After some time the bleeding may stop. On a vaginal examination the external os is found closed but the cervical canal is ballooned out and is like an inverted cone due to the presence of the ovum therein.

(6) *Missed Abortion*. In this rare condition symptoms of abortion occur but subside later without any part of the ovum being expelled. The ovum dies but is retained in the uterus. The patient gradually recovers from the attack of pain and the vaginal hæmorrhage subsides. The hæmorrhage that has occurred *in utero* forms a clot round the dead ovum and subsequent changes take place. In the early stages the clotted blood with the contained ovum presents a peculiar condition which is known as a *blood mole*. Later when the blood clot becomes organised the appearance changes and in the course of a few weeks the whole of the uterine contents are changed into a whitish shaggy mass known as a *carneous mole*. Occasionally in these cases owing to the formation of hæmatoma of varying size between the amniotic and the chorionic membranes a further change takes place resulting in the formation of what is known as a *tuberosc mole*. Where a mole has developed the foetus may not be present or even if it does exist it is of very small size. This is due to the fact that in the large majority of cases molar formation takes place in the early weeks of pregnancy and because of the death of the foetus at that stage and the considerable period that elapses before the mole is expelled together with absorption of the foetus the foetus is either rudimentary or entirely absent. Where molar formation has taken place the amenorrhœa may persist but other changes take place which go to show that none of the progressive signs of pregnancy are present. Thus the uterus does not continue to enlarge in size the breast changes cease the patient may not feel any of the subjective symptoms of pregnancy, and generally presents herself at the out patient clinic for the persistent amenorrhœa. A bimanual

examination will reveal that the uterus though enlarged never corresponds to the period of amenorrhœa the cervical softening does not persist, and the uterus itself does not have the soft feel or globular shape of a normal pregnancy. If a pregnancy test—Aschheim Zondel or Friedman's test—be done at this stage the result will be negative. Where the uterus is of a fairly large size a roentgenogram may reveal the absence of any foetal skeleton.

(7) *Febrile Abortion* Where signs and symptoms of abortion exist with a rise of temperature the condition is spoken of as febrile abortion. This may be due to two distinct factors—

(a) In one set of cases the rise of temperature may precede the signs and symptoms of abortion and may be the causative or at least one of the causative factors. In such cases the usual symptoms of abortion are present—pain hæmorrhage etc—and the temperature is the cause and not the result of abortion.

(b) *Septic Abortion* Here the temperature is entirely due to the presence of a septic focus associated with abortion. In these cases the rise in temperature is due to sepsis and the patient besides presenting the usual symptoms of pain and hæmorrhage will also have an offensive discharge.

The two conditions must be well differentiated as the treatment will be found to differ with the particular type of febrile abortion.

(8) *Therapeutic Abortion* Where abortion is induced as a therapeutic measure for the sake of the mother the condition is spoken of as therapeutic abortion. The indications for therapeutic abortion are becoming more and more limited and it is scarcely justifiable nowadays except in the presence of some very definite factor to resort to therapeutic abortion. Conditions like active tuberculosis certain types of cardiac disease renal diseases and toxæmias of pregnancy such as hyperemesis gravidarum chorea gravidarum etc may occasionally necessitate therapeutic abortion. It is essential in every one of these cases to be armed with a second independent medical opinion before resorting to this procedure. It is hardly necessary to state that therapeutic abortion is not the method of treatment in cases complicated with varying degrees of contraction of the pelvis nor should it be thought necessary to resort to it as a measure of relief in the acute or chronic general diseases.

(9) *Criminal Abortion* This term is applied where abortion is induced with a criminal intent. According to the law of the land it is an offence to interfere with pregnancy for any reason other than therapeutic causes and even then not unless a second medical opinion favours such a measure. Criminal abortion

unfortunately, is practised in most countries and is one of the potent factors in the causation of maternal mortality

Diagnosis The diagnosis of the different forms of abortion depends upon the signs and symptoms already mentioned. Certain conditions have to be differentiated from abortion. Prominent among these are —

- (1) Ectopic gestation
- (2) Hydatidiform mole
- (3) Functional menstrual disturbances
- (4) Tumours of the uterus such as myomata
- (5) Carcinoma of the uterus

To take the last three conditions first it is generally easy to differentiate between these and abortion. In functional menstrual disturbances the woman has irregular menstruation, there may be amenorrhœa for periods varying from six to eighteen weeks but the history is generally suggestive. A profuse bleeding occurring at the end of that period may suggest the possibilities of an abortion but a careful bimanual examination will reveal the fact that the size of the uterus is not increased that its shape is not changed that there is nothing suggestive of pregnancy so far as the condition of the cervix is concerned and that the hæmorrhage is unassociated with the passage of any products of conception. In cases of doubt an Aschheim Zondek test or a Friedman's test will be helpful.

Tumours of the uterus such as fibromata do not give rise to the period of amenorrhœa preceding the hæmorrhage. The shape and size of the uterus *al o* are factors to be taken note of. Few of the early symptoms of pregnancy will be present, occasionally the breasts may show certain changes but the Aschheim Zondek test will always be negative.

Carcinoma of the cervix or body of uterus. It is rarely that difficulties will arise in the diagnosis of this condition. In some cases pregnancy may be associated with carcinoma when the case may be mistaken for one of abortion. A vaginal examination will however, reveal the cause of the hæmorrhage if the growth is in the cervix. The hardness the ulceration the reddish appearance and if necessary a biopsy will settle the diagnosis.

When carcinoma exists in the body of the uterus pregnancy is not likely to occur. In those rare cases where it does occur the diagnosis is very uncertain till the abortion has become complete. A microscopical examination of the scrapings of the uterus may reveal the nature of the disease or in some cases the nature of the discharge may suggest the possibility of the condition.

The chief conditions to be differentiated in hæmorrhages occurring in the first trimester of pregnancy are abortion *extra uterine*

pregnancy and vesicular mole The following table will help in elucidating the particular condition responsible for the bleeding —

ABORTION	EXTRA UTERINE	VESICULAR MOLE
<i>Pain</i>		
Is intermittent but not unduly severe	Sudden, very severe pain followed by faintness	Pain of a mild degree or no pain at all in early stages
<i>Hæmorrhagic Loss</i>		
There is a certain amount of bleeding sometimes profuse	Bleeding <i>per vaginam</i> may occur in small quantities It is never profuse and may be bright red in colour as in cases of abortion and is sometimes granular	Bleeding may be profuse
<i>Contents Passed</i>		
Portions of the ovum may be passed, or the whole sac may be expelled	A decidual cast may be passed entire or in portions An examination of the cast would reveal the absence of chorionic villi	Occasionally the characteristic cysts may be passed which appear like white currants in a red jelly
<i>Condition of the Patient</i>		
Depends upon the amount of external bleeding and the collapse is proportionate, there is no shock	The shock and the collapse are very great, the collapse being out of all proportion to the amount of external bleeding	There is little shock but the collapse is severe depending upon the extent of the bleeding
<i>Size of Uterus</i>		
Proportionate to the period of amenorrhœa	Much smaller than the period of amenorrhœa warrants uterus pyri form in shape	Much bigger than the period of amenorrhœa warrants soft and boggy
<i>Condition of the Adnexa</i>		
The adnexa may be normal	Unilateral pulsatile painful and tender swelling in one or other of the lateral fornices or in Douglas pouch	The adnexa may not be involved or in some rare cases bilateral cystic swellings may be felt on either side of the uterus but not intimately connected with the uterus and not painful or tender, not pulsatile

DIAGNOSIS OF THE DIFFERENT VARIETIES OF ABORTION

Threatened Abortion In this condition the history of amenorrhœa, the slight pain and bleeding and the occasional palpation of the uterine contractions associated with the pain, suggests the case being one of threatened abortion. On bimanual examination the enlarged globular uterus contracting occasionally, the bloody discharge and in some cases, particularly in multiparæ, the slight dilatation of the cervix suggest the possibility of abortion. It is impossible in these cases at the first examination and even for some time later, to be definite as to the diagnosis of threatened

abortion or of any of the other varieties. The safe rule in such cases is to treat every case as one of threatened abortion till such signs and symptoms manifest themselves and make it possible to classify it under one of the other varieties described.

Inevitable Abortion This condition is more easily diagnosed as certain positive findings must be present before one can consider a case inevitable. Usually besides the pain and hæmorrhage there is dilatation of the cervical canal. The external os generally admits the finger and on bimanual examination the ovum can be felt. Occasionally portions of the decidua or the ovum are expelled. The hæmorrhage may be profuse. In some cases the bag of waters may rupture and painful uterine contractions characteristic of ordinary labour pains may be present.

Incomplete Abortion The question often arises and it is sometimes very difficult to decide definitely whether abortion is complete or otherwise. The history may be useful but is not conclusive. The examination of the patient bimanually may help to some extent. The size of the uterus, the extent to which the cervical canal is still open, the amount of bleeding, the palpation of any shreds of membranes or placenta or foetal remnants are all points which favour the conclusion that the abortion is incomplete. An irregular continuous hæmorrhage, even very small in amount, with or without pain, with occasional bouts of hæmorrhage occurring in between, always suggests the possibility of some bits of tissue having been left behind. In some cases the diagnosis is possible only when the uterus is explored either by a curette or by the finger.

Cervical Abortion This condition can be diagnosed by the history as well as by the local findings. The fullness of the cervical canal and the manner in which it is dilated in the form of an inverted cone indicate that the separated ovum is lodged in the cervical canal. Occasionally if the external os is slightly patulous the ovum may be felt by the examining finger.

Missed Abortion The diagnosis of this condition is by no means easy. The history of the case is of considerable value and it is often only by observing the case for some time that a definite diagnosis can be reached. In cases of missed abortion several changes may take place in the ovum. If the patient is examined at intervals it will be found that while the uterus does not enlarge to correspond with the period of amenorrhœa and although it is bigger than normal the size at subsequent examinations is either stationary or shows some slight diminution. The persistence of the amenorrhœa and of the uterine enlargement without increase together with retrogressive changes in the other signs of pregnancy arouse the suspicion that it may be a case of missed abortion. The ovum can be retained till the period of normal gestation is over and in some cases even for a much longer period.

Prognosis The prognosis depends upon any complication that may be present. Usually the bleeding is not marked and the expulsion of the products of conception may take place spontaneously without any undue risks to the mother. In some cases however severe hæmorrhage and collapse may result and if not attended to in time may entail grave risk to life. Where abortion is complicated with other conditions or is a result of general or constitutional diseases, the prognosis is rendered worse. Factors which influence the prognosis unfavourably in cases of abortions are —

- (1) Excessive amount of hæmorrhage
- (2) Presence of constitutional disease
- (3) Presence of sepsis
- (4) The time at which assistance is available and the method of treatment adopted

The patient may recover from the effects of abortion but certain sequelæ may persist such as subinvolution, chronic endometritis or metritis, displacements of the uterus and adnexal troubles. It is unfortunate that many patients do not realise that there is as much need for rest and proper attention after an abortion as after a full time labour and the frequency with which complications and sequelæ occur after abortion is due in a large measure to neglect on the part of patients to take proper rest and care.

Prophylaxis Whenever there is a history of previous abortion the patient should be carefully examined along the lines which we have indicated above. In many cases if the diseased conditions likely to cause abortion such as chronic inflammation of the uterus or appendages or displacements of the uterus are treated in time the abortion may not occur. In particular attention must be drawn to the possibility of syphilitic infection, septic foci, endocrine disturbances and deficiency diseases. When pregnancy occurs care should be taken to see that the patient has rest, that uterine sedatives are given in cases with history of previous abortions and that any particular causative factor is attended to such as syphilis. No purgatives should be given in the first half of pregnancy but the bowels must be carefully regulated by mild laxatives or enemata. The diet of the patient should be specified. Particular care should be taken at the probable dates of the menstrual epoch when the tendency to abort is greater than during the intervals. Too much emphasis cannot be laid on the fact that at these times absolute rest is essential. In such cases the patient should not be allowed to move about freely till after the twentieth week.

Treatment—*Threatened Abortion* The patient should be put to bed immediately and complete rest ordered. Any examination

that may be necessary should be done with the greatest amount of care and gentleness. It is well to give the patient $\frac{1}{4}$ grain of morphia or any other preparation of opium either by mouth or hypodermically. A general and uterine sedative is indicated and a common prescription for this purpose is —

Extractum viburnum prunifolium liquidum	$\frac{1}{2}$ drachm
Calcium lactate	10 grains
Liquor morphia hydrochloride	10 minims
Sodium bromide	10 grains
Tincture auranti	15 minims
Tincture belladonna	5
Aqua to make	1 oz

In some cases small doses of ergot 5 minims of the liquid extract may be added with a view to tone up the uterine muscle and prevent hæmorrhage.

The diet should be light and nutritious and must be largely fluid. Two particular precautions must be taken the patient should on no account be given any purgatives and the bowels must never be allowed to become constipated. A glycerine enema or a small soap and water enema or one or other of the different preparations of liquid petroleum is indicated. It is well to keep the patient in bed for a few days after the bleeding has completely stopped. Recovery from this condition may be said to have taken place when the hæmorrhage stops the pain gradually subsides and examination after an interval reveals that the uterus is gradually increasing in size. On the other hand in some cases the hæmorrhage continues more or less irregularly sometimes in larger quantities with intervals of absence of bleeding or only very slight hæmorrhage. Under these circumstances the question arises when may a case of threatened abortion be considered to have become inevitable? It is important that this fact should be recognised as the treatment necessarily differs in the two conditions. The following signs and symptoms indicate that a case of threatened abortion is no longer such but has become inevitable —

- (1) If there is very profuse bleeding with dilatation of the cervical canal and portion of the ovum is felt
- (2) If portions of the decidua or ovum are actually expelled outside
- (3) If there is repeated small attacks of hæmorrhage continued over a fairly long period two or three weeks, resulting in signs of secondary anæmia
- (4) If a bimanual examination reveals that the uterus has not increased in size and that probably it is gradually diminishing
- (5) When there is an offensive discharge suggestive of sepsis attended with an elevation of temperature

In such cases the treatment is that of inevitable abortion.

Inevitable Abortion. In these cases the abortion is bound to occur, but the question is whether any active interference is indicated or not. No definite rule can be laid down, but it may be safely said that the less of interference the better. In the majority of cases inevitable abortion will end spontaneously, and we cannot deprecate too much the impression that once the abortion is inevitable it must necessarily be interfered with. On the other hand, in the presence of severe hæmorrhage or repeated small hæmorrhages, or if the pain is very severe, or if a portion of the ovum has actually been passed out and the cervix is gaping it is



FIG. 76.—Digital evacuation of the uterus.

sufficiently dilated preliminary dilatation is necessary. After the cervical canal has been dilated up to the largest size Hegar's or Mathew Duncan's dilators, the finger is passed and the ovum gently separated. Care must be taken in dilating the cervix and in separating the ovum to prevent perforation of the uterus. The ovum thus separated is removed either by ovum forceps or by the sponge forceps. The ovum forceps is bigger in size and it may be difficult to pass it through the cervical canal. We therefore prefer to use sponge forceps in such cases, as it is smaller and can be easily passed in to grasp the ovum. With gentle twisting and light traction the whole of the ovum can be removed with ease. A vaginal douche may be given, followed by injections of echolics, such as pituitary extract and ergotin. The patient is returned to bed and the subsequent care is similar to that given in the puerperium after normal labour.

Another method of dealing with these cases is by tamponade of the vagina. Where the cervix is not easily dilatable and the patient is bleeding, particularly if pregnancy is advanced beyond the twelfth week, it is well to apply a vaginal tampon after taking due aseptic precautions. The tampon may be left in for periods ranging from twelve to twenty-four hours. If the uterus begins to contract there is no necessity to give any drug, but if the uterus is soft and there are no contractions, it is as well to provoke uterine contractions by giving small doses of pituitary extract— $\frac{1}{2}$ to $\frac{1}{4}$ c.c. every four hours. An alternative is to give quinine—3 to 5 grains—every two hours. If the uterine contractions are sufficiently strong the plug may be expelled from the vagina, or if not it is removed. It is sometimes found that the ovum has been expelled from the uterus and is lying in the vagina above the tampon, or the cervical canal may be sufficiently dilated to allow of evacuation in the manner already described. In some cases when the plug has not caused cervical dilatation it may be necessary to replug the vagina, or cervical dilatation may be proceeded with by the use of metallic dilators and the evacuation then completed.

The use of a flushing curette in cases of abortion has its limitations. When a curette is used it must be a blunt flushing curette, and its chief use is not so much actually to remove the remnants of the ovum from the uterine attachment as by the mechanical flushing to allow the ovum which has been partially separated to become completely separated and so facilitate removal. The curette may be used, but we would emphasise the necessity for exploration of the uterus by the finger after such a procedure, as not infrequently large bits of placenta or ovum have been left inside after an apparently thorough curettage of the uterus. In some cases after removal of the ovum an intra-uterine douche may be given to wash out any small bits of placenta or blood-clot

that have been left behind Budin's intra uterine nozzle or Bozeman's intra uterine catheter is used for this purpose

Where the cervix is hard and not easily dilatable and where the signs and symptoms point to a rapid evacuation being necessary it is well to consider the possibility of evacuating the uterus by vaginal or, in some cases by an abdominal hysterotomy This may also be the line of treatment adopted in cases of therapeutic abortion as by this procedure there is much less shock less hæmorrhage and less chance of sepsis In cases complicated by heart disease or tubercle of the lung or certain general diseases it is better to employ either of these methods of evacuation particularly if the pregnancy has exceeded fourteen to sixteen weeks than the ordinary vaginal methods

There is one procedure which does not commend itself to us and that is the use of laminaria tents for dilatation of the cervix in cases of inevitable abortion The tents are likely to carry infection and it would be unfortunate if sepsis were to complicate the subsequent stages of the condition

Missed Abortion and Cervical Abortion In either of these conditions active measures are necessary to evacuate the uterus In some cases it is true that the patient may have a sudden hæmorrhage and the uterus empties itself spontaneously But when the diagnosis has been definitely made it is not desirable to wait for such an occurrence and the evacuation of the uterus by operative procedure becomes a matter of necessity The cervix is dilated by passing a few metal dilators the vagina plugged and the patient given an injection of pituitary extract After eight to twelve hours the condition of the cervix may allow of the uterus being evacuated if it has not already expelled the ovum An alternative suggested is the use of intramuscular injections of estrodiolbenzoate 200 000 international units every eight hours for eight days

On the whole in the absence of definite indications we prefer the conservative method of treatment in cases of abortion leaving nature as far as possible to complete the process of evacuation and we have seen no harm result from this procedure Where however indications arise on account of continuous hæmorrhage severe pain or other causes one may be forced to interfere

Febrile Abortion Where signs of abortion are present associated with elevation of temperature the condition may be due either to a septic factor or to a complication which causes the temperature and is probably also the cause of the abortion In the latter group of cases there may be no necessity for interference and the abortion will terminate spontaneously unless severe hæmorrhage occurs when it may be completed by any of the methods already suggested Where however the abortion is complicated with sepsis and is incomplete particular care is required in the treatment In many

cases such septic abortion may be the result of active interference and in some it may be due to previous diseased conditions of the vagina or cervix. The most beneficial line of treatment in such cases is never to interfere as long as the patient has an elevation of temperature. The patient should be kept at rest, drainage favoured by raising the head of the bed, mild vaginal douches might be given if necessary and the general condition of the patient improved. After the temperature has settled down to normal and has continued to remain normal for four to five days the question of evacuation if it is necessary may be considered. If however at any stage during this interval profuse bleeding occurs which necessitates interference the uterus is emptied if possible by gentle manipulation with the finger.

We cannot emphasise the fact too strongly that expectant methods of treatment give the most satisfactory results in cases of infected abortion. Active interference and emptying of the uterus are associated with serious risks. They spread the infection by breaking down the barrier of leucocytic layer which has formed in the uterus. This results in a rise of temperature which may persist for days. It is therefore accepted now as a safe policy that in cases of infected abortions whether associated with temperature or not there should be the minimum amount of interference.

One method of treatment should be avoided in cases of infected abortion and that is plugging of the vagina. This carries with it certain definite risks of retaining the septic discharges and favouring absorption and spread of infection.

Complications *Perforation of the uterus* especially when the uterus is retroverted or retroflexed is a not infrequent occurrence and may be responsible for a fatal termination by causing peritonitis. In some cases the perforation may involve injury to the bowel or to the omentum. Where such injury complicates the perforation or where internal bleeding is suspected it is necessary to perform a laparotomy and to repair the damage otherwise expectant treatment suffices.

Hæmorrhage is another common complication and may sometimes be alarming. Injection of ecbolics, plugging of the uterus and the vagina if necessary, elevation of the foot of the bed and general treatment for the collapse should be adopted.

Another complication is where the operation has not resulted in a complete evacuation of the uterus. When small bits of placenta are left behind they continue to cause hæmorrhagic discharge and occasionally a placental polypus may form at a later date. They may also give rise to sapremia or secondary infection. Where a portion of the foetus itself is left behind decomposition is bound to occur resulting in septic discharge, elevation of temperature

passage of small bits of the foetal remnants associated with increasing pain and discomfort. Treatment is along lines already indicated for incomplete abortion.

A mistake which is so tragic in its results is to curette the uterus when the condition is one of a ruptured ectopic gestation which is referred to in the chapter on extra uterine pregnancy. Immediate laparotomy is the only possible method of dealing with that condition.

HABITUAL ABORTION

This unfortunate occurrence is fairly common and gives rise to some anxiety as to the proper method of treatment to be adopted. The most careful examination of several of these cases has revealed no obvious causative factor. When a woman comes with a history of repeated abortion sometimes seven or eight or even more occurring more or less at the same period of pregnancy, somewhere between the twelfth and twenty eighth weeks the condition requires thorough investigation from all points of view. As we have already stated in our experience syphilis is not the factor responsible for such repeated abortions. Toxicurias diabetes displacements of the uterus cervical erosions deficiency in diet hypothyroidism and other endocrine disturbances may all be considered as factors directly or indirectly favouring the possibility of this condition and must receive proper and adequate treatment. The patient should be treated with a supporting diet with plenty of vitamins particularly A D and E. Calcium must be given in fair doses if there is any evidence of hypocalcemia. When pregnancy occurs the patient should be kept in bed uterine sedatives administered particularly at the menstrual epochs. It is well to gain the confidence of the patient and to instil in her sufficient encouragement so that the dread of abortion may not be constantly weighing with her. We have found it impossible to control the mental factor in some of our cases and in spite of all precautions they have promptly aborted on the day or about the week when they expected the abortion to take place. The treatment on the whole is not satisfactory, and further research into this baffling condition is necessary.

CHAPTER XXIII

ECTOPIC PREGNANCY

This term is applied to the condition where the fertilised ovum develops at a site outside the uterine cavity. The term 'extra uterine' is also sometimes applied, but strictly speaking this term does not include those rare conditions where pregnancy

occurs in a uterine horn or where it occurs in the interstitial portion of the tube and impinges on the uterine cavity. Thus ectopic pregnancy may occur not only in the Fallopian tubes and ovaries,

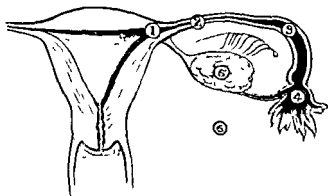


FIG. 77.—Section of the uterus and appendages. Posterior view showing the several sites of extra uterine gestation.

but also in a horn of the uterus, or in the interstitial portion of the tube and the cornua of the uterus.

Varieties. The chief varieties are :—

- (1) Ovarian pregnancy.
- (2) Primary abdominal pregnancy.
- (3) Tubal pregnancy.
- (4) Pregnancy in a rudimentary uterine horn.

When an extra-uterine pregnancy occurs in the Fallopian tube it may occur in any of the following situations :—

- (1) In the interstitial portion.
- (2) Isthmial portion.
- (3) Ampullary portion.
- (4) Infundibular portion.

OVARIAN PREGNANCY

This is a very rare occurrence, but several cases of true ovarian pregnancy have been reported in the literature.

Here fertilisation occurs in the Graafian follicle, so that the fertilised ovum implants itself directly into the ovarian tissue. Generally there is no decidual formation in these cases.

The condition of ovarian pregnancy is difficult of diagnosis. Spiegelberg has laid down that the following four conditions must be fulfilled before ovarian pregnancy is diagnosed.

- (i) The Fallopian tube on the affected side must be intact
- (ii) The pregnant mass must occupy the position of the ovary, and there should be no separate ovary on the affected side
- (iii) The gestation sac must be connected to the uterus by the ovarian ligament
- (iv) A histological examination must reveal the presence of definite ovarian tissue in the wall of the sac

Although rupture is by no means uncommon in this condition a greater proportion of cases of ovarian pregnancy reach full term than do cases of tubal gestation. Occasionally the ovum may be destroyed inside the follicle and thus a mole is formed.

Primary Abdominal Pregnancy This is one of the rarest forms of extra uterine gestation. Theoretically it is possible and a few cases are reported in the literature. There is some doubt as to whether such cases are in reality cases of primary abdominal pregnancy or cases of secondary abdominal pregnancy. From a clinical point of view the differentiation is not important.

TUBAL PREGNANCY

Pregnancy may occur in any of the four situations already mentioned namely in the interstitial isthmal ampullary or infundibular portions of the tube. Sometimes one may speak of a tubo ovarian pregnancy where an infundibular gestation has become attached to the ovary.

It may be well here to state the normal process of fertilisation of the ovum. Usually the ovum when it is extruded from the Graafian follicle is wafted into the free fimbriated extremity of the Fallopian tube of the same side by the peritoneal fluid current that is set up. As a result of the ciliary movement in the Fallopian tube, as well as slight contractions of its musculature the ovum is carried along the lumen of the tube where the spermatozoon generally meets it. Fertilisation then takes place and the fertilised ovum gradually passes on towards the uterus. The endometrium of the uterus is by this time prepared to receive the fertilised ovum and the ovum thus settles on the lining membrane of the wall of the uterus and then burrows into it through the influence of its trophoblast.

In a case of tubal gestation on the other hand the normal course of events is interrupted either by mechanical factors or by some other factor which favours the development of the fertilised ovum in the tube. Among the mechanical factors that may be responsible for this condition are —

- (1) An unduly long or tortuous tube
- (2) Congenital anomalies of the tube such as diverticulæ

- (3) Chronic salpingitis favouring the destruction of the ciliated epithelium of the Fallopian tube and thereby interfering with the movement of the fertilised ovum as well as by causing placæ adhesions and formation of lacunæ in which the ovum is trapped. The previous inflammation is generally of gonococcal origin but may have originated during a previous puerperium.
- (4) Pressure from outside compressing the lumen of the tube may be caused by tumours or inflammatory adhesions.
- (5) The fertilisation of a wandering ovum—that is an ovum from the ovary on one side which wanders and enters the Fallopian tube of the opposite side during which period the ovum is continuously developing and therefore has reached a size much bigger than is favourable for its transmission through the tube as well as being at the stage in its development where its penetrative properties have appeared.

Among the other factors responsible for this condition may be mentioned decidual reaction of the tube the exact causation of which is not yet known. This reaction may lead to the fertilised ovum being implanted in the tube. On the other hand it may result from embedding of the ovum in the tube.

Mode of Implantation of the Ovum. When the fertilised ovum is arrested in any portion of the tube it burrows itself into the wall of the tube on account of the eroding and penetrating properties of the chorionic epithelium. There is no real decidual formation or decidual reaction in the stroma of the tubal mucosa there is however increased congestion and softening of the parts. The ovum after burrowing rapidly into the softened and highly vascularised tissues forms a capsule of the muscular tissue of the tubal wall. Because of the absence of decidual formation the destructive action of the trophoblast is not controlled and thereby the muscular wall of the tube becomes eroded. The erosion involves the blood vessels and the placental tissue consequently has not got a strong hold on the maternal tissues. As the ovum grows the muscular tissue attempts to hypertrophy, but the power of hypertrophy being very small and nothing in comparison to that of the uterine musculature at an early stage in the course of pregnancy the tube is not able further to accommodate the growing ovum. The thinning of the Fallopian tube on account of the trophoblastic influence uncontrolled with decidual cells as well as the mechanical distension of the lumen of the tube by the growth of the ovum results in early rupture of the tube if other methods of termination have not occurred previously.

Changes in the Uterus Simultaneously with the changes in the tube the uterus in the majority of cases enlarges, but this is not proportionate to the enlargement that occurs in intra uterine gestation, nor does the uterus assume the typical globular shape characteristic of intra uterine gestation. There is a decidual reaction of the endometrium, which accordingly becomes thick and spongy and is similar to that of the decidua vera in a uterine pregnancy. It does not, however, contain any chorionic elements and is generally passed out of the uterus in whole or piecemeal at the time when the tubal gestation terminates either by rupture or by abortion.

TERMINATIONS OF TUBAL GESTATION

From what has been stated above it is obvious that a tubal gestation cannot possibly go on for a long time without interruption. The possible terminations vary with the site of the gestation

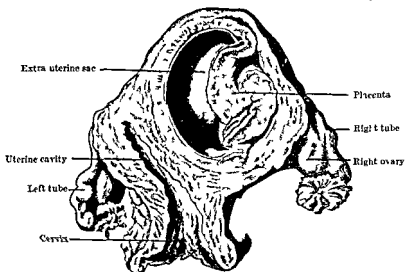


FIG. 78.—Section of an interstitial pregnancy

and we will now consider each site and discuss the possible terminations.

A Interstitial Pregnancy Here the fertilised ovum is implanted in the interstitial portion of the tube and it is possible for it to progress for a much longer period than in the other regions. The period of its continuation depends upon the extent to which the implantation involves some portion of the uterine cavity. The terminations in this condition are —

- (i) Tubal abortion
- (ii) Tubal rupture
- (iii) Tubal mole formation
- (iv) Tubo uterine pregnancy

Tubal Abortion. Owing to the situation of the ovum as it develops and the trophoblastic influence on the blood vessel being felt more and more, intratubal rupture most commonly takes place and the mass is extruded towards the uterine cavity because of dilatation of the uterine end of the Fallopian tube. If the ovum is entirely expelled into the uterine cavity, hæmorrhage is checked by contraction of the muscular fibres and the mass thus expelled may be passed out of the uterus and may be mistaken for an ordinary uterine abortion.

Rupture By dilatation or by erosion, rupture may occur towards the peritoneal cavity. The hæmorrhage here is fairly severe and death of the ovum generally takes place. In rare cases the rupture may not involve the placental site, and if

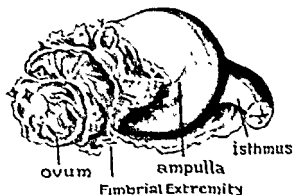


FIG. 79.—Tubal abortion

Note the ovum just being expelled at the ampullary end

the amniotic sac is preserved intact the ovum may continue to grow, thus causing the condition known as secondary abdominal pregnancy.

Tubal mole is a comparatively rare ending to interstitial pregnancy. It is much more frequent in ampullary pregnancy and will be described later.

Tubo-uterine Pregnancy. In some cases the ovum as it grows may partially embed itself on the uterine wall, and its further progress may be on the same lines as in a uterine pregnancy. It is difficult to differentiate this condition from the condition known as a cornual or angular pregnancy.

B Isthmial Pregnancy. Here the fertilised ovum implants itself in the middle and narrowest portion of the tube. Consequently rupture, which is the commonest termination, occurs at a much earlier stage, generally before the twelfth week and usually between the sixth and tenth weeks.

The secondary changes depend upon the site of the rupture with reference to the location of the placental site and the amount of hæmorrhage. As a result of rupture the following terminations may occur —

- (1) Extratubal or intraperitoneal rupture with diffuse intraperitoneal hæmorrhage and death of the fœtus and possibly the mother
- (2) Extratubal rupture with death of the fœtus and a localised formation of blood clot giving rise to the condition known as a pelvic hæmatocoele.
- (3) Extratubal rupture with continuation of the life of the fœtus and a relatively small amount of hæmorrhage into the abdominal cavity (secondary abdominal pregnancy)
- (4) Extratubal or extraperitoneal rupture with diffuse subperitoneal hæmorrhage between the layers of the broad ligament
- (5) Extratubal rupture with a small amount of hæmorrhage between the layers of the broad ligament resulting in death of the fœtus and formation of a localised broad ligament hæmatoma
- (6) Extratubal rupture with continuation of the life of the fœtus and a small amount of hæmorrhage between the layers of the broad ligaments (secondary ligamentous pregnancy)

There is no possibility of a tubal abortion taking place in a case of isthmal pregnancy and rarely does tubal mole formation occur in this condition

We shall discuss these terminations further in detail

Intraperitoneal Rupture When intraperitoneal rupture takes place it is generally preceded by an intratubal rupture. As the blood is poured into the tube the lumen is distended and the weakened musculature of the tube yields giving rise to rupture towards the peritoneal cavity. It is generally accompanied by a severe amount of shock as well as hæmorrhage resulting in serious collapse of the patient. The death of the ovum is inevitable. It is in this variety that fulminant cases of rupture of extra uterine gestation occur

In some cases however the amount of hæmorrhage may not be so great and with the death of the ovum the blood may gradually collect in Douglas pouch resulting in the formation of a pelvic hæmatocoele

More rarely if the site of rupture is opposite the placental site that is if the placenta is situated towards the broad ligament and

rupture occurs towards the peritoneal surface, the placenta may not be involved in the tear and there is a chance of the ovum continuing to survive, enclosed in its own amniotic sac. Thus results a secondary abdominal pregnancy which goes on to develop for some weeks.

Extraperitoneal Rupture In this condition rupture occurs between the layers of the broad ligament, and it is practically confined to cases of isthmal pregnancy as it is here that the broad ligament completely envelops either side of the tubal gestation mass. In such a case the rupture, if it involves the placental site, may result in a very severe form of hæmorrhage which extravasates between the layers of the broad ligament and gradually ascends up between the anterior abdominal wall and the peritoneal covering. The death of the ovum is inevitable and there is shock and collapse because of the separation of the peritoneal layer and the quantity of blood lost.

In some cases, however, the ovum may die, the hæmorrhage may not be considerable and the blood extravasated in between the layers of the broad ligament may coagulate, giving rise to a broad ligament hæmatoma.

Rarely when the rupture takes place opposite the placental site and when the placental site is situated towards the peritoneal surface the rupture may open up the broad ligament, and the ovum with the unruptured amniotic sac may be extruded partially and continue to survive, resulting in the condition known as secondary ligamentous or intraligamentous pregnancy.

C Ampullary Pregnancy. Here the ovum is implanted in the outer third of the Fallopian tube. As the ovum grows the ampullary portion is very much distended. The terminations that may occur in this condition are :—

- (i) Tubal mole.
- (ii) Tubal abortion, and
- (iii) Intraperitoneal rupture.

There is very little of the broad ligament which can stretch with the distending ampullary end, so that there is little or no possibility of an extraperitoneal rupture in such cases. Very rarely and particularly when the ovum is implanted almost at the infundibular end the pregnancy may continue to the later weeks as a tubo-abdominal pregnancy. *Tubal abortion* is by far the commonest termination. Intratubal rupture first occurs and the whole mass may then be expelled through the dilated fimbriated extremity. The mass thus expelled consisting of ovum and blood forms a pelvic hæmatocele.

Tubal mole is also likely to occur. This results from an intratubal rupture. In such cases the blood-clot surrounding

the ovum becomes organised and results in the formation of a tubal mole in much the same manner in which a uterine mole develops.

Intraperitoneal rupture in an ampullary pregnancy is not so frequent as in isthmal pregnancy, and when it does occur one



FIG. 80.—Mole formation in tubal gestation.
Note the presence of the embryo.

of the three terminations possible in intraperitoneal rupture of an isthmal pregnancy may result.



FIG. 81.—Section of a tubal mole.
Note the clear amniotic cavity.

D Infundibular Pregnancy This is merely one form of ampullary pregnancy where the ovum develops at the very end of the Fallopian tube near the fimbriated extremity. This is most likely to result in tubal abortion or it may develop into a tubo-abdominal pregnancy and go on till the later weeks of pregnancy.

Terminations of Secondary Pregnancy A secondary pregnancy may be either —

- (a) Secondary abdominal pregnancy, when the ovum after a primary tubal rupture develops in the abdominal cavity and becomes attached to the surrounding viscera and omentum, or
- (b) Secondary ligamentous pregnancy when the ovum continues to develop between the layers of the broad ligament after a primary rupture of the tube

In such cases the pregnancy may proceed for some considerable time and occasionally it may go on to term when a spurious

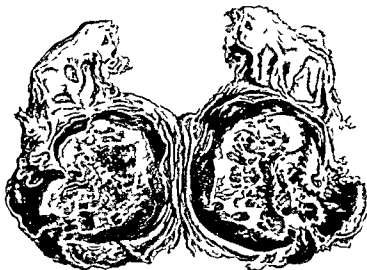


FIG. 8'—Section of a tubal mole

labour occurs resulting in rupture of the sac or death of the foetus which is followed by further changes

Secondary Abdominal Pregnancy As has been stated above this occurs in those cases of tubal gestation where rupture takes place opposite the site of placental implantation and the amniotic sac remains intact. The placental circulation may be sufficient to keep the ovum alive and a false sac forms all round which protects the ovum from damage, the foetus grows inside the sac and usually after a few weeks depending upon the nature of the sac that has been formed, a secondary rupture takes place. The result of such secondary rupture is death of the foetus with either profuse intra peritoneal hæmorrhage or a more localised form of hæmorrhage resulting in a pelvic hæmatocele. If the patient is not promptly treated there are grave risks from the hæmorrhage and the shock associated with the rupture. Should the patient survive a secondary

(1) *Before Rupture* There may be few symptoms. In fact the first serious symptom to attract any attention may be at the time of rupture. Still a careful consideration of the history of the case may reveal a few striking symptoms which should arrest the attention of the obstetrician or gynaecologist and force him to resort to a thorough pelvic examination. Among these symptoms are —

(a) *History of Atypical Amenorrhœa* The patient may have missed a period or even two but the amenorrhœa is never typical of ordinary intra uterine pregnancy. In between there may be repeated attacks of slight hæmorrhage or occasionally there may be a continuous slight hæmorrhagic discharge. The discharge is not characteristic of a menstrual flow; the colour may be slightly changed to a reddish brown and if a careful examination be made of the discharge small pieces of the uterine decidua cast off may sometimes be noticed.

(b) Associated with this history of atypical amenorrhœa the patient may complain of irregular and intermittent pains of a colicky nature referred generally to the lower part of the abdomen. These pains may be due either to the contractions of the uterus or occasionally to contractions of the musculature of the Fallopian tube. In some cases the pains are due to the peritoneal irritation set up by stretching of the tube due to increase of intratubal tension.

(c) The patient may complain of general malaise occasionally morning sickness and a feeling of discomfort and uneasiness. As a rule there is no rise of temperature. In such cases a pelvic examination is most essential and gives the first definite indication of an abnormality.

On bimanual examination the following features may be noted —

- (1) The uterus is slightly enlarged but generally not proportionate to the period of amenorrhœa.
- (2) The early signs of pregnancy such as the softening of the cervix and Hegar's sign are not obvious. The uterus itself is not globular.
- (3) The most important finding is a tender unilateral oval pulsatile swelling on one side of the uterus or occasionally in Douglas' pouch.

The actual location of the gestation in the tube may make some difference in the exact findings on a bimanual examination.

In an interstitial pregnancy the tumour is more or less continuous with the uterus so that at one cornu of the uterus an asymmetrical shape is produced. In such cases the tumour may be easily mistaken for a cornual pregnancy.

Where the gestation sac is in the isthmic portion the tumour may be felt slightly separated from the uterus while in ampullary

and infundibular pregnancies a pedicle may be found connecting the swelling with the uterus. This pedicle is formed by the remainder of the tube and consequently a certain amount of mobility of the pulsatile tumour may be obtained.

As the ovum develops the uterus may be pushed to one side or other, and in some cases may be displaced backwards or tilted anteriorly, depending upon the position that the tumour occupies in one or other of the lateral fornices or in Douglas pouch. Occasionally a slight blood stained discharge may be present on the examining finger and besides in some cases small granular particles of a reddish brown character. Particular care should be taken in making a pelvic examination to avoid unnecessary force as not infrequently cases have been reported where a somewhat rough



FIG. 83.—Ruptured tubal gestation of about 20 weeks.

Note the head and foot in the sac.

examination has resulted in rupture actually taking place on the examination table.

(2) *At the Time of Rupture or Abortion* The symptoms consequent on rupture or abortion differ in some important respects. When rupture takes place the symptoms are of a more grave nature than in the case of tubal abortion. Even when rupture takes place the resultant symptoms depend upon the nature of the changes that take place in the gestation sac. The chief signs and symptoms of rupture of an extra uterine pregnancy are those due to pain and hæmorrhage. The pain is so intense that the patient may faint and because of both the pain and hæmorrhage the patient suffers from shock and collapse. The pain is of a stabbing nature and is more severe with rupture than with abortion. The severity and the duration of the pain will depend upon the nature of the rupture and the extent of the peritoneal irritation set up. In some cases the pain may gradually subside in others the pain may be intermittent or continuous. Associated with the

pain is collapse due to intraperitoneal or subperitoneal hæmorrhage. The loss of blood may be so great that the patient is blanched, has a rapid and thready pulse and the temperature becomes subnormal, there may be extreme restlessness, "air hunger," an anxious expression, the respirations becoming rapid and shallow, till in some cases if assistance is not promptly available a dangerous amount of collapse develops, finally ending in death. The abdomen is tender, becomes distended and a certain amount of fullness may

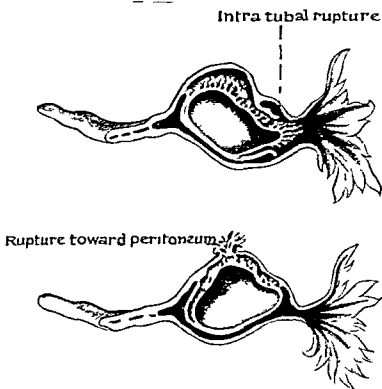


FIG. 84.—Rupture of an ectopic in the ampulla

be felt in the flanks. A sign that may be present is shifting dullness, but this is not easily ascertainable, nor is it desirable to move the patient about to elicit this sign. A bimanual examination of the patient at this time may not reveal any definite signs beyond extreme tenderness in the fornices, especially if the rupture has taken place before the twelfth week of pregnancy. In cases of diffuse intraperitoneal hæmorrhage no fullness or resistance may be felt in the fornices. It is not easy in view of the pain and the collapsed condition of the patient to make a bimanual examination with any detail, nor is it advisable in such cases to attempt to do so by pressing on the abdominal wall. Occasionally, if the patient is

seen a few hours after rupture and there has been some time for the blood to coagulate, it is possible that a soft boggy swelling, slightly pitting on pressure, may be felt in one or other of the fornices or in Douglas' pouch.

In cases of diffuse subperitoneal hæmorrhage the symptoms will be more or less similar to those of diffuse intraperitoneal hæmorrhage, but in addition there will be pressure symptoms due to the presence of blood beneath the pelvic peritoneum. Pain may be much greater owing to the stretching of the peritoneum and the shock is proportionately increased. If a broad ligament hæmatoma forms the symptoms are usually much less severe, and in some of these cases the patient after an attack of sudden pain followed by slight faintness may rally round sufficiently not to take serious note of her condition.

The symptoms of tubal abortion are slightly different from those of a tubal rupture. The pain is not of the same excruciating nature, but is more intermittent and prolonged. The shock is not severe as there is no rupture of a viscus, and the signs of collapse will set in more gradually as the leakage of the blood continues. The extent of the hæmorrhage is less than in either intraperitoneal or subperitoneal hæmorrhage, so that the hæmorrhagic collapse following tubal abortion is not so severe as in cases of rupture. Simultaneously with the changes that take place in the tube, contractions of the uterus may occur, resulting in a slight amount of hæmorrhage *per vaginam*, with the extrusion of a decidual cast, either entire or piecemeal. The amount of external bleeding is relatively small and never proportionate to the degree of collapse and may continue in a slight degree for a few days. On the other hand, in fulminant cases of intraperitoneal rupture, there may be no bleeding *per vaginam*. The passage of a decidual cast is pathognomonic of extra-uterine gestation. In our experience a complete decidual cast, which is a triangularly shaped membranous sac, smooth in its interior and shaggy outside, with three openings corresponding to those of the two Fallopian tubes laterally and the internal os below, is very rarely met with. It is much more frequent, however, in cases of tubal abortion, and it may be said with some confidence that if a complete decidual cast is expelled the diagnosis of tubal abortion will be far more frequently correct than that of tubal rupture. In some cases where periodic attacks of pain occur following slight rupture or repeated attempts at tubal abortion, the decidual cast may be passed in bits mixed with the blood.

In cases of tubal abortion a bimanual examination may possibly reveal the presence of a mass to one side of the uterus. This is a hæmatocele which forms generally in Douglas' pouch, and it may be present more or less as a crescentic swelling extending from

may be general malaise occasional vomiting and sometimes attacks of faintness. Slight elevation of temperature may also be present and the patient may complain of slight vaginal bleeding continuing for days. In some cases a sudden attack of severe pain may recur followed by symptoms of severe collapse. Gradually the swelling in the pelvis increases in size and may be felt on abdominal palpation. A more or less severe grade of anemia may result. A hæmatological examination will reveal the presence of a leucocytosis with a diminution in the number of red cells and total hæmoglobin content. A vaginal examination will show the presence of a tender soft swelling filling the pouch of Douglas and extending to the lateral fornices. The swelling pits on pressure is painful and tender and may be mistaken for an inflammatory swelling or a pelvic abscess. Irritation of the rectum with tenesmus may also be complained of.

(b) *Two to Three Weeks after Rupture* Besides the characteristic history that may sometimes be elicited in such cases the patient complains of a chronic dull aching pain in the lower part of the abdomen and pelvis and a certain amount of fullness in that region with symptoms of difficulty in micturition and defecation. The discharge of blood *per vaginam* may have stopped by this time but the other symptoms referable to chronic peritoneal irritation may still be present together with general malaise languor a slight elevation of temperature loss of appetite and occasional attacks of vomiting. The patient may be definitely anæmic and may complain of general debility.

A bimanual examination in these cases will reveal the presence of a somewhat resistant mass filling the whole of Douglas' pouch which does not easily pit on pressure and may therefore be mistaken for an inflammatory swelling. The uterus is incorporated in this swelling neither can the tubes and ovaries be palpated separately. If these cases are left untreated the temperature may gradually settle down and the patient more or less recover but there will be a permanent amount of induration in the pelvis which may lead to chronic pelvic pain associated occasionally with menorrhagia and metrorrhagia. In other cases the swelling may become infected and an abscess forms with elevation of temperature attacks of shivering and a rise in pulse rate with exacerbations of pelvic pain. Later the abscess may point at one of the situations already mentioned and discharge pus with some relief of symptoms but leaving a sinus behind.

Signs and Symptoms of Abdominal Pregnancy Primary abdominal pregnancy is extremely rare. A few cases have been recorded in the literature but care is required in discriminating between primary and secondary pregnancy.

Secondary abdominal pregnancy on the other hand is a

one lateral fornix to the other behind the uterus. The mass may in some cases be continuous with the tube of the affected side. The uterus is generally displaced by the hematocele and it may be pushed to one side or forwards, pulsation may occasionally be felt in this mass but the typical unilateral pulsation may not be quite so obvious when tubal abortion has taken place.

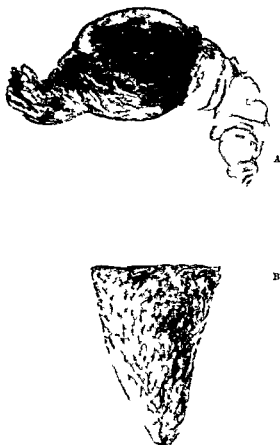


FIG. 83.—Ectopic gestation

A. Tubal abortion showing the ovum being extruded.

B. Decidual cast expelled in the same case.

(3) *After Rupture of the Gestation Sac* We prefer to consider the condition of the patient at two different periods.

(a) *Within a few days after rupture of the gestation sac* The history of the patient is important and if a good history is elicited it will put the obstetrician on guard as to the possibility of a ruptured tubal gestation having occurred previously. At this stage the patient may complain of a dull aching pain in the pelvis associated with some difficulty in micturition or defecation. There

may be general malaise occasional vomiting and sometimes attacks of faintness Slight elevation of temperature may also be present and the patient may complain of slight vaginal bleeding continuing for days In some cases a sudden attack of severe pain may recur followed by symptoms of severe collapse Gradually the swelling in the pelvis increases in size and may be felt on abdominal palpation A more or less severe grade of anæmia may result A hæmatological examination will reveal the presence of a leucocytosis with a diminution in the number of red cells and total hæmoglobin content A vaginal examination will show the presence of a tender soft swelling filling the pouch of Douglas and extending to the lateral fornices The swelling pits on pressure is painful and tender and may be mistaken for an inflammatory swelling or a pelvic abscess Irritation of the rectum with tenesmus may also be complained of

(b) *Two to Three Weeks after Rupture* Besides the characteristic history that may sometimes be elicited in such cases the patient complains of a chronic dull aching pain in the lower part of the abdomen and pelvis and a certain amount of fullness in that region with symptoms of difficulty in micturition and defecation The discharge of blood *per vaginam* may have stopped by this time but the other symptoms referable to chronic peritoneal irritation may still be present together with general malaise languor a slight elevation of temperature loss of appetite and occasional attacks of vomiting The patient may be definitely anæmic and may complain of general debility

A bimanual examination in these cases will reveal the presence of a somewhat resistant mass filling the whole of Douglas pouch which does not easily pit on pressure and may therefore be mistaken for an inflammatory swelling The uterus is incorporated in this swelling neither can the tubes and ovaries be palpated separately If these cases are left untreated the temperature may gradually settle down and the patient more or less recover but there will be a permanent amount of induration in the pelvis which may lead to chronic pelvic pain associated occasionally with menorrhagia and metrorrhagia In other cases the swelling may become infected and an abscess forms with elevation of temperature attacks of shivering and a rise in pulse rate with exacerbations of pelvic pain Later the abscess may point at one of the situations already mentioned and discharge pus with some relief of symptoms but leaving a sinus behind

Signs and Symptoms of Abdominal Pregnancy Primary abdominal pregnancy is extremely rare A few cases have been recorded in the literature but care is required in discriminating between primary and secondary pregnancy

Secondary abdominal pregnancy on the other hand is a

well recognized condition that occurs as a sequel to primary rupture of a tubal gestation. Tertiary abdominal pregnancy has been known to occur in cases of rupture of an intraligamentous pregnancy following a primary tubal rupture. In cases of abdominal pregnancy the foetus may develop to full term and a spurious labour occurs with intraperitoneal hemorrhage and death of the foetus. The hemorrhage may be so severe as to cause grave collapse. In some conditions however the hemorrhage may be very limited and a dead foetus remains in the abdomen for months or even years. When the foetus dies in a secondary abdominal pregnancy it may undergo maceration adipocere formation mummification formation of a litlopedion or suppuration. No special symptoms may arise in a secondary abdominal pregnancy and the patient may not be conscious of the fact that anything is wrong till she comes to full term. The movements of the foetus can be felt with much greater ease and the foetal parts may be palpable more superficially than would ordinarily be the case in a uterine gestation. The history that may be elicited from the patient may be very suggestive. It will reveal the fact that the patient in the early weeks of pregnancy had experienced sudden severe abdominal pain and other symptoms characteristic of primary rupture. As the pregnancy continues the patient may feel uncomfortable and complain occasionally of pain in the abdomen obstinate constipation general malaise and occasionally jaundice with slight elevation of temperature and signs suggestive of toxic abortion. On careful bimanual examination suspicion may first be aroused from the following findings: the cervix is not soft and may often be displaced from its normal position and in rare cases the body of the uterus may be felt as a distinct mass separate from the gestation sac. A rectal examination may be of use in confirming the findings of a vaginal examination. A skiagram may sometimes be of help as often in cases of secondary abdominal pregnancy anomalies of foetal development may be noted also the fact that the foetus occupies a position far away from the pelvic brim and even the false pelvis which is not the case in a normal pregnancy.

Diagnosis The diagnosis of an extra uterine gestation at its various stages depends upon a careful consideration of the several signs and symptoms already referred to.

Before Rupture It may be mistaken for chronic salpingitis ovarian cyst fibroids inflammatory conditions of the pelvic cellular tissue or an angular pregnancy. The points to be taken into consideration in the differential diagnosis of this condition are —

(1) The presence of symptoms of pregnancy with an irregular type of menstrual history.

(2) Alterations in the shape and size of the uterus

- (a) The uterus is enlarged but not proportionate to the period of pregnancy
- (b) It is not globular in shape but more or less preserves the pear shape of the unimpregnated uterus
- (c) The softening of the cervix is only slightly marked
- (d) The softening of the lower uterine segment (Hegar's sign) is absent

(3) Palpation of a unilateral pulsatile swelling which is painful and tender and to one side of the uterus

In spite of all that has been stated the number of occasions when competent persons have mistaken one for the other proves the difficulty of diagnosing the condition correctly under certain circumstances. It is safer to operate on all doubtful cases. This should be the proper method of treatment in conditions which simulate an extra uterine gestation.

At the Time of Rupture At this stage the differential diagnosis rests between a uterine abortion or any acute abdominal condition such as perforation of a gastric or duodenal ulcer, appendicular colic, renal colic or a twisted ovarian cyst. Occasionally a uterine abortion may occur in association with any of these conditions and in such cases it is only by noting all that has been expelled from the uterus and by a careful examination of the patient that a diagnosis is possible. The history of the case, the sudden colicky pain with signs of severe internal hæmorrhage, the expulsion of a decidual cast, the occurrence of slight uterine bleeding—all these signs must put one on guard. Where there is any doubt with regard to the diagnosis it is better to anaesthetise the patient and make a thorough examination and when such an examination is made it is as well to be prepared for immediate operation.

A *retroverted gravid uterus* is occasionally confused with a ruptured ectopic gestation of some duration. It is very important to diagnose this condition as the method of treatment is entirely different and any error in diagnosis may lead to serious consequences. To differentiate between these two conditions the points to be noted are —

- (1) History of amenorrhœa — this is typical in a retroverted gravid uterus but atypical in an ectopic gestation
- (2) The pain and hæmorrhage are both severe in a ruptured ectopic while in a retroverted gravid uterus there is little or no hæmorrhage and the pain except in the very late stages is never acute

- (3) Bladder symptoms are more frequent in a retroverted gravid uterus whereas in an ectopic they are not quite so common till some time has elapsed after the rupture
- (4) A bimanual examination is of great importance. The position of the cervix and the direction of the cervical canal ought to be noted and it will be found that in a retroverted gravid uterus the cervix is generally displaced upwards sometimes almost underneath the symphysis pubis and that the cervical os is pointing forwards the fundus is felt posteriorly. In an ectopic gestation on the other hand the cervix may be pushed up or to one side but the cervical canal is pointing in a more or less normal direction and a soft mass which may be pulsatile is to be felt in Douglas pouch and more laterally. In cases of doubt it is always well to pass a hypodermic needle through the soft swelling in Douglas pouch when on withdrawing the piston a certain amount of blood or serosanguineous fluid may be drawn into the syringe. This would almost conclusively prove that it is a case of ruptured extra uterine pregnancy.

Twisting of an ovarian cyst gives rise to severe pain and signs of shock. But the history of atypical amenorrhœa is not generally present and in the majority of cases a bimanual examination will reveal the presence of the cervix and the body of the uterus in more or less their normal position while the twisted cyst will probably be much higher. There is no vaginal bleeding nor is a decidual cast passed *per vaginam*.

A very rare complication was once met with where with an intra uterine pregnancy of twelve weeks duration the patient was admitted with severe signs of shock and collapse. On opening the abdomen it was found that a very much enlarged spleen the result of chronic malaria had twisted its pedicle and the intense congestion had led to a definite amount of hæmorrhage into the peritoneal cavity. Further this twisted enlarged spleen with the long pedicle was partially lying in Douglas pouch. A splenectomy was performed the patient made an uneventful recovery the uterine pregnancy went on to full term and delivery of a live child occurred spontaneously.

Appendicular Colic Renal Colic Biliary Colic the Condition associated with Perforation of a Gastric or Duodenal Ulcer. These conditions cause signs and symptoms peculiar to the particular condition and the previous history is also of value in differentiating them. It is well to bear them in mind when one is considering a case of possible ruptured extra uterine gestation.

When the patient seeks advice some weeks after rupture the signs of a pelvic hæmatocele will generally be present. A mass is found filling the whole of Douglas pouch and in some cases pulsations may still be felt. The definite outline of the uterus may not be made out, the patient often complains of difficulty with micturition and defecation. It is not uncommon in such cases to mistake this for an inflammatory swelling or *per contra* an inflammatory swelling of the tubes associated with pelvic cellulitis may not infrequently be mistaken for an old ruptured extra uterine gestation. The history if carefully elicited may be of some value. Passing a needle through Douglas pouch may sometimes reveal the presence of old blood clot. We would deprecate any attempt at a posterior colpotomy as it may give rise to subsequent infection of the mass in the pelvis. If however one is prepared to open the abdomen straightaway a posterior colpotomy may be done with care in suitable cases for purposes of diagnosis.

The diagnosis of secondary abdominal pregnancy is a matter of considerable difficulty. Not till labour pains have set in may the suspicion arise that it is possibly a case of secondary abdominal pregnancy. If the patient is suffering from any signs suggestive of toxæmia and the foetal movements are felt very easily and the foetal parts palpated superficially a careful history should be elicited and a skiagraph should always be taken. If a sound is passed with care into the uterus it at once shows that the uterus is enlarged to a minor degree and is obviously not pregnant. This should be done only if immediate laparotomy is possible.

Prognosis The prognosis in this condition depends upon several factors of which the following are important —

- (1) The time at which the diagnosis is first made
- (2) The period of gestation
- (3) The seat of gestation
- (4) The particular termination of the gestation—whether rupture abortion or mole formation
- (5) The secondary changes that occur
- (6) The availability of suitable treatment

The danger is at its maximum at the time of rupture and if prompt surgical aid is not available the condition is very grave. If a mistake is made in diagnosis or prompt surgical aid is not given in time the condition may likewise prove a serious one.

While the prognosis should at all times be guarded with proper and immediate treatment there is no doubt that very many gravely ill cases respond satisfactorily. In the majority of cases surgical treatment is the only possible method of saving the mother.

The prognosis so far as the foetus is concerned does not arise where death of the ovum occurs in the early months. In those

very rare cases where the foetus continues to develop till term is reached, it must be borne in mind that fully 50 per cent of the foetuses are deformed, and the risks incidental to the mother are so great in trying to save the foetus that it is a question whether the child should ever be considered.

Treatment. The treatment of this condition depends upon the stage at which the woman seeks assistance. Broadly speaking, a woman may seek aid—

- (1) Before rupture of the ectopic sac when the patient complains of indifferent health, with occasional attacks of colicky pains and the examination reveals the presence of an intact tubal gestation.
- (2) The patient is seen at the time of rupture, when she is suddenly seized with severe abdominal pain and profound collapse.
- (3) The patient has had for some time abdominal pain with a more or less slight continuous bleeding *per vaginam*.
- (4) The woman is seen with a dull aching pain in the lower part of the abdomen and has difficulty with micturition and defecation.
- (5) The woman is in the later months of pregnancy with signs suggestive of some toxic absorption, where the ectopic has advanced as an abdominal pregnancy to the thirty-second to fortieth week.
- (6) The woman comes with symptoms of discomfort, pain in the abdomen, general malaise and incidentally it is discovered that she has got a dead foetus in an extra-uterine sac.
- (7) The woman comes with signs of infection—either a pelvic abscess or a chronic sinus discharging remnants of the foetal skeleton.

sacrifice an apparently healthy tube. On the other hand, it has been argued that a conservative line of operative treatment is desirable, and so in such cases it is recommended to perform a salpingotomy, remove the diseased ovum and leave the tube behind, or a partial salpingectomy may be performed and the remnant of the tube made patent and left *in situ*. Cases have been recorded where, after such a conservative operation, uterine pregnancy has occurred. But in some cases recorded in the literature, and within our experience, an ectopic gestation has recurred in the remnant of the tube left behind. A policy between these two extremes seems desirable, and we are content with leaving the unaffected tube and removing the diseased one entire in cases of unruptured ectopic gestation.

(2) *Patient is seen in a Condition of Collapse with a Sudden Attack of Severe Pain*. In this case the causative factor may be a rupture of an extra uterine gestation or occasionally a tubal abortion. In the fulminant type of cases where the collapse is extreme and the pain intense, rupture has occurred. The extent of the hæmorrhage depends upon the seat of the rupture, being more in isthmal and interstitial pregnancies than in the ampullary type.

The question that arises under such circumstances is, when should the operation be performed? Is it justifiable to wait in the hope that the patient may rally from the condition of collapse and the shock? We hold that an immediate operation is the best procedure. So long as the patient is not operated upon there is little chance of her improving, for hæmorrhage continues from the ruptured sac and the patient loses more and more blood, so that her condition gradually becomes worse. While steps are taken to rally the patient, the operation should be done preferably under a local anæsthetic.

After carrying out the usual preliminary procedures the abdomen is opened into by a subumbilical median incision. As soon as the abdominal cavity is opened blood wells up. Little or no time should be wasted in trying to mop up the blood and the best method of controlling the hæmorrhage at this stage is to dip the hand into the pelvis, feel for the uterus and then laterally for the adnexa, and locating the diseased tube lift it upwards by the fingers and apply two clamps, one to the infundibulo pelvic ligament beyond the ruptured tube and another to the uterine end of the tube. This arrests further bleeding and the surgeon can now proceed to mop the abdomen free of the fluid blood. Where the hæmorrhage has been recent and a good deal of fluid blood is available it can be mopped up by a sponge and then squeezed into a sterilised solution of 2 per cent sodium citrate. The citrated blood is returned to the patient intravenously after filtering it through

layers of sterilised fine muslin. This is termed *autohæmo transfusion* and in our experience the patient has been found to respond with promptness after such transfusion. After clamping the tube at either end the tubal sac is removed. The ovary is conserved if this is possible and it is in a healthy condition. The cut ends of the tube are secured by ligatures and the two edges are brought together so as to re-form the broad ligament. As far as possible all the blood and any clots in Douglas pouch and in other parts of the abdominal cavity are mopped out. The other tube should also be examined as occasionally in such cases it is the seat of an hæmatosalpinx. The exact cause for the formation of the hæmatosalpinx is not known. It is a matter for serious consideration whether this tube should also be removed unless the tube is diseased there does not seem to be any justification.

It is important to emphasise the fact that as little time should be spent as possible in the general toilette of the abdomen. The abdomen is then closed in layers and the patient removed to bed where further treatment for collapse is continued. The sooner the operation is done after a primary rupture the greater are the patient's chances of survival.

Even in those fulminant cases where apparently the woman appears to be *in extremis* the pulse ranging from 140 to 152 it is our experience that an immediate operation with simultaneous treatment for collapse has proved successful.

The alternative of waiting and watching in the vain hope that the patient may rally is invariably or almost invariably fatal.

In some cases where a tubal abortion is the cause of the sudden attack of pain and collapse the same treatment as has been described above is to be adopted.

(3) *Patient has had for some time Abdominal Pain with a more or less Slight Continuous Bleeding.* Such cases require careful consideration. While we do admit that an immediate operation as in the fulminant cases of rupture may not be necessary it must be clearly realised that the condition is a grave potential danger as a second rupture may take place at any time or further hæmorrhage of an alarming nature may occur at a time when the patient cannot be attended to immediately. Further a fresh attack of hæmorrhage of a severe nature in a patient who has already been exsanguinated renders the prognosis so much more grave that it is advisable in these cases once a definite diagnosis has been made to perform the operation as early as possible.

The operation is on the same lines as that adopted at the time of rupture except that in these cases it will often be found that a good deal of blood clot is present in the pelvis and the lower abdomen and that the intestines, omentum, tubes and uterus have become adherent. The condition may be the result of a previous

rupture or a tubal abortion and in cases of rupture the terminations may have been a formation of pelvic hæmatocele or a broad ligament hæmatoma. In any case the patient should be prepared for an abdominal section the abdomen opened and with care the uterus and adnexa freed from the adhesions. The diseased tube should be clamped and removed.

Conservative methods of treatment to remove only the diseased ovum and leave the tube or a portion of it have been commended by certain operators. The diseased nature of the tube the slight oozing that is likely to occur and the fact that such a tube is likely to become adherent again would seem to suggest that little or no advantage is to be gained by such conservative methods of treatment and if one is playing for safety first one is quite justified in performing a salpingectomy and removing the whole of the diseased tube. The operator should then attempt to remove all blood clots especially in those cases where large blood clots are found in Douglas pouch and interspersed between the intestines and the omentum it may be that a prolonged toilet of the abdomen is attended with considerable risk of shock and it is our experience that the more prolonged the operation the greater is the shock and subsequent collapse. For these reasons the toilet of the abdomen should be confined to the necessary minimum.

(4) *The woman is seen with a Dull Aching Pain in the Abdomen with Difficulty in Micturition and Defecation*. These are cases where a pelvic hæmatocele has been present for some time and is causing pressure on the urethra and rectum and thus producing difficulty with micturition and defecation. In such cases a careful history will give one the clue to the diagnosis of the condition.

Two methods of treatment are available for this condition the expectant method and the operative method of treatment.

The *expectant method* consists in absolute rest in bed hot fomentations vaginal douches ichthyol and glycerine tampons and the administration of general tonics. These are done with a view to favour absorption of the blood clot as far as possible. This is not however a method to be commended for two reasons firstly the absorption is never complete and generally leaves a certain amount of chronic adhesive plastic peritonitis which later may give rise to trouble besides seriously interfering with the proper functions of the genitalia. Secondly it can never be predicted whether a pelvic hæmatocele may not suppurate and so give rise to further complications. It is therefore very much to be preferred—except in those rare cases where the patient absolutely refuses the operation or other complications are present which contraindicate any operative procedure—that an operation be performed.

As regards the *operative method* two courses are open the pelvic hæmatocele may be dealt with either by the abdominal route or the vaginal route We very much prefer and have always practised the abdominal route for this purpose, except in those rare cases where the hæmatocele is already infected The advantage of the abdominal route is that the clots can be removed completely and advantage may be taken to examine the adnexa, to remove the diseased tube to free the structures from adhesions and bring the uterus into position, suspending it if necessary to prevent its becoming displaced again

By using the vaginal route blood clot is removed without entering into the general peritoneal cavity, but it must be remembered that occasionally this method may itself favour infection if the vagina is already infected The other disadvantage that the adnexa and the uterus cannot be properly treated is obvious Where, however the pelvic hæmatocele is already infected, it is not desirable to open up the general peritoneal cavity and hence posterior colpotomy is preferable

(5) and (6) *Ectopic Gestation in the Later Weeks of Pregnancy*
This is a very serious condition and there is considerable difficulty in deciding as to the best method of treatment The first thing to be recognised is whether the child is alive or not If the child is alive there is free circulation of blood through the placental sinuses, the main problem for the operator under these circumstances is how effectively to control the bleeding after separation of the placenta On the other hand when the foetus has been dead for some time the placental sinuses gradually shrink Consequently the hæmorrhage that is likely to be encountered from the separation of the placenta will be much less so that it would appear that from the point of view of the mother it is safer for an operation to be done after the child is dead One cannot, however, prognosticate with any degree of certainty whether a rupture might not take place at any time during the course of pregnancy when the foetus is alive The effect of a rupture will be such a severe loss of blood that the patient may be in *extremis* before any assistance is available The problem thus is a delicate one and conflicting considerations have to be borne in mind in selecting the safest method of treatment

The ideal treatment is to remove the foetus and the entire sac, so that the child may be delivered alive and the whole of the after birth may be effectively removed without any damage to the mother We have already stated that the child is very often deformed in these cases and if the condition is met with before full term it does not seem to be a justifiable proposition to delay the operation with a view to prolong the life of the foetus intra abdominally What, then, is the best method of treatment? Thus

or has actually burst through one or other of the surrounding structures, the most conservative method of treatment should be adopted to evacuate the contents. If, however, the contents cannot be reached through the vaginal route the abdomen may have to be opened into at a place where there is the least possible risk of infection spreading to the general peritoneal cavity and where effective drainage can be secured. It is better not to attempt a too vigorous treatment with a view to remove the whole of the contents, but to allow it to drain continuously and thus evacuate itself.

Pregnancy in a Uterine Horn. One type of uterine malformation is where a small vestigial sac is present which sometimes communicates with the main cavity. Occasionally the fertilised ovum migrates into this sac and develops there and causes the same difficulties that are met with in cases of tubal gestation. The development of the ovum in the rudimentary horn is associated with the formation of a false decidua in the uterine cavity proper. The uterus increases in size. As the muscular tissue of the rudimentary horn is poorly developed and cannot keep pace with the progressively enlarging ovum, there is a tendency for rupture to take place. This may occur at any time within the first sixteen weeks of pregnancy.

It is difficult to diagnose this condition with any degree of certainty. When the pulsating tumour corresponding in size to the duration of pregnancy is detected alongside the slightly enlarged uterus, suspicion may be roused as to the possibility of pregnancy in a rudimentary horn. Before operation it is almost impossible to differentiate from the more common tubal gestation. The round ligament, if felt, is the landmark in the differential diagnosis. This ligament is external to the gestation sac when the pregnancy is in a rudimentary horn, while in tubal gestation it is on the mesial side. More often the diagnosis is made at laparotomy again by recognising the position of the round ligament with reference to the gestation sac, whether it be intact or ruptured.

Treatment. The only thing to do is to remove the pregnant horn of the uterus, *conserving the main cavity of the uterus* if possible. In cases, however, where the horn has developed sufficiently to distort the main cavity, or where bleeding cannot be controlled, it may be necessary to perform a hysterectomy.

REPEATED EXTRA-UTERINE PREGNANCIES

Not infrequently a woman who has had an extra-uterine pregnancy once may have symptoms of an extra-uterine on the other side. Such cases are on record and are within our own experience. In one case the patient had three consecutive

CHAPTER XXIV

HÆMORRHAGES IN THE THIRD TRIMESTER OF PREGNANCY AND FIRST TWO STAGES OF LABOUR

THERE are several causes of vaginal hæmorrhage in the last weeks of pregnancy but the most common of them all is premature separation of the placenta. A pregnant woman may also bleed from causes which may give rise to hæmorrhage in a non gravid woman such as cancer of the cervix a fibroid or a mucous polypus of the cervix erosion of the cervix a cervical varix or from trauma the result of a fall or an accident producing lacerations of the vaginal canal or cervix. Apart from these accidental factors the main cause is the separation of either a normally or an abnormally situated placenta. The placenta is in the large majority of cases situated in the upper uterine segment or zone of contraction usually near the fundus on the posterior wall of the uterus and less frequently on the anterior wall. The placenta may in some cases be situated wholly or partially in the lower uterine segment or zone of dilatation. When hæmorrhage occurs as a result of the separation of a normally situated placenta—that is in the zone of contraction or upper uterine segment—the condition is spoken of as accidental hæmorrhage or *abruptio placentæ* as in the large majority of cases the hæmorrhage is accidental although there may be some underlying pathological factor. An abnormally situated placenta is spoken of as a *placenta prævia* and hæmorrhage from it is termed unavoidable hæmorrhage because owing to the situation of the placenta its separation and consequent hæmorrhages must occur when the lower uterine segment dilates and the birth of the child takes place *per viæ naturales*.

Occasionally the separation of an abnormally situated placenta may result from causes similar to those which bring about the separation of a normally situated placenta and in some cases both causative factors may come into play for example when a membranaceous placenta or a large placenta of twin pregnancy separates partly from causes which produce accidental hæmorrhage and partly because of the low placental insertion.

Abruptio Placentæ

This condition is met with fairly frequently and in some cases it is responsible for the death and extrusion of the ovum in the earlier periods of pregnancy as well. At the Government Hospital for Women and Children Madras there were 200 cases of *abruptio placentæ* in 20470 confinements during a period of six years giving an incidence of 1 in 107 cases.

Ætiology There are two principal causative factors underlying this condition —

- (1) Toxæmia of pregnancy, and
- (2) Diseases of the endometrium and the ovum

In the majority of the severe cases of *abruptio placentæ* some signs of toxæmia will be noted, such as the presence of albumin in the urine a high blood pressure preceding the onset of hæmorrhage and subjective symptoms usually suggestive of toxæmia. In some cases of toxæmia it has been noticed that patients either develop eclampsia or manifest signs and symptoms of *abruptio placentæ* in which case the signs of eclampsia do not appear.

Endometritis degeneration of the decidua arteriosclerosis syphilitic changes pertaining to the vessels and metritis may all produce changes in the placenta as well as in the endometrium leading to the possibility of a premature separation of the placenta.

The immediate cause of the hæmorrhage may often be trauma as from a sudden fall a blow or kick on the abdomen severe jolting as in an automobile journey, or during coitus. Occasionally separation of the placenta may be caused by factors which arise during the course of labour, such as —

- (1) The sudden emptying of the uterus in cases of pronounced hydramnios
- (2) Precipitate labour
- (3) A short or a relatively short cord as in a cord round the neck pulling on the placenta
- (4) In delivery of twins
- (5) In attempts at version and breech extraction

Varieties Clinically cases of *abruptio placentæ* are divisible into three kinds—mild moderate and fulminant.

From a pathological point of view they may also be divided into three kinds —

- (1) Concealed accidental hæmorrhage
- (2) Revealed accidental hæmorrhage
- (3) Mixed variety

In *mild* cases of accidental hæmorrhage there may be a certain amount of external bleeding which occurs during the course of labour with fairly good uterine contractions delivery being completed without much assistance being needed. In these cases the only evidence of this condition may be a certain amount of

external bleeding prior to delivery, or the presence of one or more retroplacental clots passed with the expulsion of the placenta

In the moderate cases of accidental hæmorrhage signs of bleeding internal or external are manifest and occasionally the life of the fœtus may be endangered. But the uterus is able to contract and in the large majority of cases labour terminates spontaneously or with slight assistance

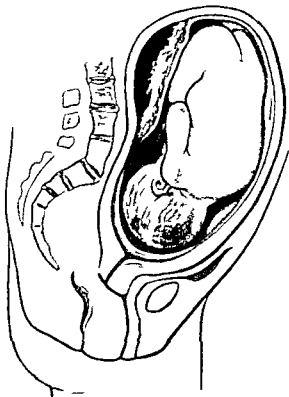


FIG. 87.—*Abruptio Placentæ*

Note the hæmorrhage into the amniotic cavity

In cases of the *fulminant* type which are mostly of the concealed variety the onset is sudden and accompanied by severe pain and signs of shock and hæmorrhagic collapse. These are the most fatal forms of *abruptio placentæ* and they invariably lead to death of the fœtus as well as seriously endanger the life of the mother

Pathology The hæmorrhage that occurs in *abruptio placentæ* is from the placental sinuses and as the sinuses remain open and no clot formation takes place the bleeding continues. The blood may collect in one of several situations

- (1) Behind the placenta as a large retroplacental clot
- (2) Between the membranes and the uterine wall separating both the placenta and the membranes from the uterine wall
- (3) In the amniotic cavity the blood finding its way into it by a tear through the membranes
- (4) Behind the presenting part as in cephalic presentations when the head is fixed
- (5) Occasionally the blood may extravasate into the muscular tissue of the uterine wall or may find its way through the Fallopian tubes into the peritoneal cavity

Whether the blood ultimately escapes outside or not will depend upon the condition of the uterine musculature its tonicity and power of contraction. If the uterine muscle is not diseased but has a normal tone it will contract when the blood escapes from the placental sinuses and thereby force it outside. In some cases the blood may from the very start find its way out alongside the membranes and through the partially dilated cervical canal. Where the uterine musculature itself is extensively diseased as in toxæmia of pregnancy its tone is completely lost so that the blood collects within the uterine cavity and may distend it enormously. A fatal intra uterine hæmorrhage may occur without any escape of blood externally. The mildest cases which are the most common are the purely external variety of hæmorrhage. In the moderate cases the hæmorrhage first tends to collect inside the uterine cavity but as the tonus of the uterine musculature does not allow the uterus to be distended beyond a certain limit the contractions of the uterus are provoked and the hæmorrhage at a later stage becomes revealed. These are the cases grouped in the mixed variety of accidental hæmorrhage.

In cases of the fulminant type however the extensively diseased condition of the uterine musculature allows the hæmorrhage to continue and distend the uterine cavity so that a great amount of blood is lost and the patient may bleed internally to death without any of the blood finding its way out. The complete loss of the tonicity of the uterine musculature is due to the hæmorrhage in between the muscular fibres of the uterine wall. It is thus not in a position to contract and labour does not occur or if it does it is easily arrested owing to the overstretching of the uterine musculature by the blood collecting within.

Symptoms The symptoms depend upon the variety of the case.

Mild Cases In these cases the patient may complain of slight pain and occasionally there is tenderness over the uterus accompanied with some loss of blood externally. Labour pains begin and generally in the absence of any other complication with rupture of the membranes the bleeding stops and labour is

terminated spontaneously or with slight assistance. In some of the cases where external evidence of bleeding is not present the condition is diagnosed only by the passage of dark blood-clots with the placenta after delivery of the child. Such dark blood-clots are always suggestive of antepartum hæmorrhage due to partial separation of a normally situated placenta.

Moderate Cases Here the patient may be seized with some degree of pain, generally referable to the fundal portion of the uterus, accompanied by signs of slight hæmorrhagic collapse. The pulse rate may increase and its volume and tension may also be affected. The severity of the symptoms depend upon the amount of blood loss and the accompanying shock. The foetal heart may be audible or intra-uterine death of the fœtus may occur and the foetal movements may therefore not be felt.

Fulminant Cases The clinical picture in such cases is very striking. The onset is sudden and associated with severe pain. In a short time the patient may present all the signs of shock and hæmorrhagic collapse. The pulse is small and quick; there is pallor, cold clammy sweats; the face shows anxiety; dyspnoea and restlessness together with thirst and air hunger, vomiting may occasionally be present and the patient may complain of dizziness, faintness, precordial pain and dimness of vision. She may sometimes enter into a condition of semi consciousness or delirium, followed by convulsions, gradually passing on to coma and death.

Physical Signs. In the mild and moderate degrees of *abruptio placenta* the physical signs may not be much in evidence. Hæmorrhage externally may be the first sign which calls for particular attention. The uterus may be a little more enlarged, somewhat tense, painful and tender. Foetal parts may not be easily palpable in the moderate cases of accidental hæmorrhage and the foetal heart may or may not be audible, depending upon the extent of separation of the placenta.

In every case of external bleeding, or where there are signs and symptoms of hæmorrhagic loss in a pregnant woman, a vaginal examination should be made. The cervix may be found partially dilated, there may be some blood-clot present in the cervical canal and the membranes and the presenting part are usually felt. Placental tissue is not within reach of the examining finger.

In cases of the fulminant type the patient will be in the condition of shock and hæmorrhagic collapse described above. The temperature is subnormal; the pulse is rapid and thready; marked pallor is present; the vaginal mucous membrane also shows a white appearance. On abdominal palpation the uterus will be found much bigger than normal, of a hard wooden consistency, painful and tender. No foetal parts can be felt on palpation and the foetal heart is not heard.

Diagnosis Sudden onset of pain with increase in the size of the uterus, tenderness a certain amount of external hæmorrhage, together with signs of hæmorrhagic collapse or shock absence of increasing signs of anæmia indicate a severe type hæmorrhage. This condition has to be differentially diagnosed from the

- (A) Placenta prævia
- (B) Acute hydramnios
- (C) Rupture of the uterus
- (D) Other acute abdominal crises

The following are the points of differential diagnosis —

(A)

*Abruptio Placentæ**Placenta Prævia*

- | | |
|--|--|
| 1 Hæmorrhage comes on all at once | Hæmorrhage repeated from time to time |
| 2 Sense of tearing pain with shock | Hardly any pain and no shock |
| 3 Signs and symptoms of toxæmia may be present | Rarely present in placenta prævia |
| 4 Collapse disproportionate to amount of external bleeding | Collapse always proportionate to the amount of external bleeding |
| 5 Uterus may be tense and of a ligneous consistency | Uterus soft |
| 6 Uterus extremely tender and painful in fulminant type | No tenderness no pain complained of unless labour has commenced |
| 7 Fœtal parts not easily palpable | Fœtal parts easily palpable |
| 8 Fœtal heart inaudible generally | Fœtal heart may be audible in the early stages at any rate |
| 9 Vaginal examination no placental tissue felt within reach of fingers | Placental tissue always felt in the zone of dilatation |

(B)

*Abruptio Placentæ**Acute Hydramnios*

- | | |
|---|---|
| 1 Onset sudden | Onset sudden |
| 2 Pain and tenderness over the uterine region present | Pain and tenderness over the uterine region present |
| 3 Signs of hæmorrhagic collapse always present pulse being rapid and thready | No signs of hæmorrhagic collapse, signs of shock may be present, pulse being rapid but not hæmorrhagic in character |
| 4 Signs of pallor due to anæmia present | No signs of pallor noted |
| 5 Uterus of a ligneous consistency | Uterus tense but not of a ligneous consistency |
| 6 Fœtal parts not palpable Fœtal heart not heard | Fœtal parts not palpable Fœtal heart not heard |
| 7 Vaginal examination bag of waters not so tense, presenting part easily palpable | Vaginal examination a very tense bag of membranes, presenting part not palpable and distinct thrill may sometimes be elicited |

C

Abruptio Placentæ

- 1 Onset sudden
- 2 Pain and tenderness severe
- 3 Occurs in the first stage of labour
- 4 The uterus is hard and of a wooden consistency
- 5 Signs of shock and collapse present
- 6 F H is inaudible in the severe cases

Tonic Contraction of the Uterus

- Onset gradual, result of prolonged labour
- Pain is severe but tenderness may not be marked
- Is a result of obstructed labour in the second stage
- Uterus is tonically contracted and the retraction ring is prominently felt
- Signs of prolonged labour and exhaustion present but no signs of collapse
- F H may be rapid or occasionally inaudible

(D)

Abruptio Placentæ

- 1 Condition occurs during pregnancy and without any sign of labour
- 2 Outline of the uterus distinct
- 3 Contractions of the uterus may be present
- 4 Uterus enlarged and tense foetal parts not palpable
- 5 Membranes may be felt intact on vaginal examination
- 6 Presenting part may be felt without any caput
- 7 Urine when withdrawn of normal colour or high colour

Rupture of Uterus

- Usually the result of prolonged labour except in cases due to external violence or where uterine scar has given way
- Indistinct outline of the uterus
- No uterine contractions felt
- Foetal parts may be palpated with undue ease the uterus being felt as a hard tumour to one side
- Membranes always ruptured and vagina dry and hot
- Presenting part generally felt with a large caput
- Urine often blood stained

Sometimes conditions such as biliary renal or appendicular colic or the rupture of an abdominal viscus twisted ovarian cyst or other intra abdominal emergency occurring during pregnancy may give rise to signs and symptoms of hæmorrhage and shock similar to those of *abruptio placentæ*. But a careful examination of the patient considered along with a careful history will generally enable the obstetrician to make the diagnosis without much difficulty. Occasionally an exploratory laparotomy may be the safest method of diagnosing as well as treating the condition.

It is well at this stage to discuss the signs and symptoms which may differentiate hæmorrhagic collapse from shock.

Shock

- 1 Patient is quiet, lying listless on her back
- 2 *Respirations shallow and quick*
- 3 Dizziness and faintness may be complained of
- 4 Skin cold and clammy
- 5 Pulse is feeble and may be fast or slow and can be felt at the radial artery
- 6 Temperature may be subnormal
- 7 The superficial veins are not collapsed and can be easily exposed on dissection for transfusion

Hæmorrhage

- Patient is very restless and anxious
- Respirations laboured, deep and gasping, air hunger present*
- Dizziness, faintness and dimness of vision, ringing in the ears and cramps complained of
- Skin cold and clammy
- Pulse feeble always fast and almost imperceptible at the wrist
- Always subnormal
- Superficial veins are always collapsed

Prognosis The mild cases are readily amenable to treatment, and if attended to, the prognosis is good for the mother and may not be unfavourable for the fœtus

In the moderate cases or the mixed variety the prognosis is not unfavourable for the mother if suitable treatment is adopted, but prognosis for the child is bad

In the fulminant cases the fœtus is invariably dead and the mother runs grave risks

The factors which influence the prognosis are —

- (1) Presence or absence of toxæmia
- (2) Presence of uterine contractions and whether the condition occurs during labour or in pregnancy
- (3) The amount of hæmorrhagic loss before the patient is brought under observation
- (4) The presence or otherwise of any complications such as contracted pelvis
- (5) The nature of treatment adopted and the facilities available

Treatment The factors to be taken into consideration in deciding the proper mode of treatment to be adopted are —

- (1) The general condition of the patient
- (2) Whether the patient is a primipara or a multipara
- (3) Whether the woman is in labour or not
- (4) Whether case is mild moderate or fulminant
- (5) Whether the hæmorrhage is external wholly internal or partially external and internal
- (6) The condition of the uterus whether atonic contracting feebly or contracting well
- (7) The condition of the fœtus

- (8) The condition of the cervical os
- (9) The facilities available for treatment, that is whether the treatment is in an institution or nursing home with adequate facilities or in a private house

The lines of treatment that may be adopted in these cases are —

- (1) Puncture of the membranes
- (2) Injections of small doses of pituitary extract $\frac{1}{2}$ c.c. at a time
- (3) Vaginal tamponage
- (4) Dilatation of the cervix and immediate delivery either by forceps or after podalic version
- (5) Cæsarean section—abdominal or vaginal
- (6) Cæsarean hysterectomy

The objects in view whatever method of treatment may be adopted should be —

- (1) To arrest the hæmorrhage
- (2) To promote delivery
- (3) To treat the condition of shock and collapse
- (4) To prevent postpartum hæmorrhage and
- (5) To save the child if possible without increasing the risk to the mother

The prognosis so far as the fœtus is concerned is in many cases unfavourable due to prematurity and loss of blood so that the treatment is more often directed to saving the mother

We shall now consider the treatment to be adopted for each of the clinical varieties

(1) MILD CASES

(a) *When the Patient comes in with evidence of External Hæmorrhage and the Uterus is contracting the woman being in Labour*
If in such cases associated with hæmorrhage the cervix is over two fifths dilated and the head is presenting rupture the membranes put on a tight abdominal binder and give $\frac{1}{2}$ to $\frac{1}{4}$ c.c. of pituitary extract. In the majority of cases the increased force of the uterine contractions will cause the fœtus to compress the placenta against its site and so arrest hæmorrhage. The further course of labour will be spontaneous.

If the patient however comes in with external hæmorrhage of a fairly severe type and the cervix is not dilated or easily dilatable vaginal tamponage with a tight abdominal binder and if necessary a small dose of pituitary extract will arrest the hæmorrhage and

promote uterine contractions The object of vaginal plugging is threefold —

(i) The vaginal plug prevents the escape of the blood externally thus causing it to be retained in the uterine cavity and so increases intra uterine pressure Between the plug in the vagina and the tight abdominal binder above the placenta is compressed when the uterus is contracting thus arresting or materially diminishing the loss of blood

(ii) The vaginal plug acts as a stimulant and provokes uterine contractions and in consequence promotes dilatation of the cervix

(iii) If the vaginal plug is properly applied the uterine arteries as they ascend along the lateral wall of the uterus are compressed by the plugs in the fornices and thus the flow of blood into the placental sinuses is diminished

Method of applying the Vaginal Plug The efficacy of this mode of treatment depends entirely upon the plug being applied properly The woman must be prepared as for any major obstetric operation the external genitalia cleansed and the pubic hair shaved A vaginal douche may be given with an antiseptic solution to wash out any blood clots and the vagina swabbed with an antiseptic such as Dettol cream After these preparations the vulva is draped with sterile towels, the operator with the usual antiseptic care draws off the urine by catheter and ruptures the membranes if they are not already ruptured Sterile plugs of cotton wool made in the form of small artificial sponges or sterilised gauze soaked in antiseptic solution and rinsed dry may be used for the plugging A posterior duck bill speculum is inserted and the vaginal fornices are first plugged tight then gradually the whole of the vagina is tightly filled with small pledgets of cotton wool A firm abdominal binder is applied over the uterus and fastened from above downwards A sterile vaginal pad is placed over the external genitalia and a bandage applied which is pinned on to the abdominal binder The vaginal plug is left *in situ* for some hours depending upon the degree of uterine contractions If the plugs are being expelled consequent upon dilatation of the cervix and descent of the presenting part they are removed a hot vaginal douche given and labour allowed to proceed If labour does not progress the pad should not be left in for more than twelve hours and in such cases it may be necessary to replug taking of course all the usual precautions described above It is rarely necessary to repack the vagina

Occasionally when the uterus does not respond effectively and labour pains are weak contractions may be stimulated by fractional doses of pituitary extract given at intervals of from three to four hours

(b) *If the patient is seen when the cervix is over three-fifths dilated, or is easily dilatable and the head is presenting and engaged, so that the greatest diameter has passed through, delivery may be effected by the application of forceps*

(c) If, on the other hand, the head is freely movable above the brim of the pelvis, and uterine contractions are not strong, it seems advisable to dilate the cervix manually and perform internal podalic version and deliver the fœtus. This method of treatment is more useful in multiparæ where no disproportion between the presenting part and the pelvis is present, and occasionally it is possible to save the life of the fœtus by such a rapid method of delivery.

We do not advocate any method of forcible delivery in any type of accidental hæmorrhage, such as dilatation of the cervix by branched metallic dilators or by multiple incisions, etc. The resulting shock, hæmorrhage, laceration and possibility of sepsis are serious factors which will vitiate a favourable prognosis, and it is not in the interests of the mother to adopt any of these methods of treatment.

We are not in favour of the use of a metreurynter in these cases, but authorities like De Lee have advocated it and found it useful. If a metreurynter is to be used the precaution should be taken to see that it is introduced after rupture of the membranes when the conditions necessary for its introduction are satisfied (*vide* chapter on Placenta Prævia)

In some cases it may be advisable to perform a bipolar version, bring down a foot and leave the half breech to dilate the cervix gradually. This method can be more readily adopted if the fœtus is already dead.

(2) MODERATE CASES

These may be cases of external accidental hæmorrhage with a moderate amount of bleeding. They may be of the mixed variety where a portion of the blood finds its way out, while the uterus itself is distended with blood-clots—the result of the formation of a retroplacental hæmatoma. The methods of treatment already mentioned above may be adopted in the moderate cases of accidental hæmorrhage.

In the mixed variety the chief point for consideration is the condition of the uterine musculature; how far the uterus has maintained its tone and to what extent it can be stimulated to contraction. Before this can be ascertained it is necessary to relieve the tension in the uterine cavity by rupture of the membranes which also helps in the expulsion of retained blood-clots. After rupture of the membranes a small dose of pituitary extract may be given to stimulate uterine contractions, and when the uterus

has begun to respond the cases may be treated on the same lines as are the mild varieties of accidental hæmorrhage

Vaginal plugging should never be attempted in the mixed variety till the uterus has begun to respond with contractions as otherwise the blood being retained inside will stretch the uterus diminish its tonus even more and cause further shock and internal bleeding

If the uterus does not respond the case then falls under the third category namely —

(3) SEVERE OR FULMINANT TYPE OF ACCIDENTAL HÆMORRHAGE

In these cases the uterine musculature is diseased and hæmorrhagic infiltration between the muscular fibres is present a condition known as *uterine apoplexy* the tone and power of contraction of the uterus is entirely lost. In such cases the condition of the patient will be one of profound shock and collapse due to the internal bleeding and none of the measures suggested above will probably be effective in saving her life

Before however attempting the methods of treatment to be outlined below it is necessary to revive the patient from the condition of shock and collapse and for this purpose she should be given injections of intravenous gum saline or glucose or where possible a transfusion of blood. The details of the treatment for shock and collapse due to hæmorrhage in the pregnant and parturient woman will be dealt with in a later chapter

There are two possible methods of treatment in these fulminant cases—abdominal or vaginal Cæsarean section with hysterectomy if necessary. In the large majority of cases for considerations to be explained later the abdominal route is to be preferred

INDICATIONS FOR CÆSAREAN SECTION IN ACCIDENTAL HÆMORRHAGE

This operation may be performed—

(1) *In cases of the fulminant type of concealed accidental hæmorrhage* where the uterus is distended with blood clots and has lost all power of contraction and tonicity

(2) *In some cases of external accidental hæmorrhage* where the bleeding is fairly free and the child is nearly full term and alive and the cervix is not dilated or rigid and not dilatable

(3) *In cases of external accidental hæmorrhage* irrespective of the condition of the foetus when the bleeding is severe and the cervix is hard rigid and undilatable

(4) *In conditions complicating external accidental hæmorrhage* such as contraction of the pelvis tumours of the uterus ovarian

cysts cancer of the cervix complicating pregnancy and other conditions which may necessitate a Cæsarean section apart from the condition of accidental hæmorrhage

(5) In cases where it is likely that the hysterectomy will be inevitable because of the complete loss of uterine tonus and the possibility of severe postpartum hæmorrhage The abdominal route is preferable here

In cases where the operator is not experienced in the vaginal technique of Cæsarean section or where all facilities are not available it is wise to perform an abdominal Cæsarean

In performing the abdominal section the patient may be simultaneously rallied and the abdomen opened under local anæsthetic After evacuation of the uterus the question to be decided is whether the uterus can be left *in situ* or should be removed. This will depend upon the condition of the uterine musculature and the tendency for postpartum hæmorrhage

Cæsarean hysterectomy is indicated in—

(1) Cases of concealed accidental hæmorrhage where the uterine musculature is the site of apoplexy and there is complete loss of its tonus and power of contraction

(2) Where the patient has already been examined internally or other manipulations done and there is reasonable suspicion of sepsis particularly if the woman is a multipara

(3) Where other complications such as uterine fibroids etc exist

Vaginal Cæsarean Section The chief advantage of the vaginal route is that there is much less risk of infection and the peritoneal cavity is not invaded Owing to the special technique of the operation and the care needed it is not one that should be commended to the junior practitioner or to those who have not had ample experience of vaginal hysterotomy or vaginal hysterectomy While vaginal hysterectomy may not be difficult after the delivery of the fœtus it requires more time and elaborate care than a supravaginal hysterectomy through the abdominal route and for this reason when the patient is in a condition of shock and collapse we do not advocate this procedure to be followed in general

Complications The chief complications in cases of accidental hæmorrhage are —

- (1) Postpartum hæmorrhage
- (2) Lacerations of the cervix consequent upon the method of delivery adopted
- (3) Delayed shock and collapse
- (4) Sepsis

It is wise to be prepared for postpartum hæmorrhage and to keep everything in readiness for its treatment

Lacerations of the cervix may be avoided by care and by the choice of a suitable method of delivery.

Delayed shock and collapse must be watched for and it is a good rule in every case of accidental hæmorrhage to treat the patient for the hæmorrhagic loss either by a transfusion of gum arabic saline or citrated or whole blood.

Septic complications are more difficult to prevent as the patient may have been treated outside before being brought to an institution and in other cases in spite of elaborate precautions it may sometimes be difficult to prevent the onset of mild sepsis because of the associated conditions of toxæmia and anæmia.

Lastly every case of accidental hæmorrhage should be carefully watched during the puerperium and the patient warned not to attempt to get out of bed too early as sudden cardiac failure or pulmonary embolism may occur in such cases.

CHAPTER XXV

PLACENTA PRÆVIA

PLACENTA PRÆVIA as the term implies is where the placenta lies in the path which the fœtus must take during its delivery *per viæ naturales*. The placenta is situated wholly or partly in the zone of dilatation or lower uterine segment. Unavoidable hæmorrhage is also applied to this condition as dilatation of the lower uterine segment must occur before vaginal delivery can be effected. This results in disproportion between the relatively inelastic placenta and its site so that separation and bleeding must occur.

Ætiology Little is known about the ætiology of this condition. The tendency to placenta prævia increases with each pregnancy and especially when the pregnancies occur in rapid succession. It has been suggested that in some cases the low insertion of the placenta may be the result of implantation of the fertilised ovum near the cervix. Placenta prævia may occur in cases of twin pregnancy and in the condition of *placenta membranacea*.

Another theory is that this condition results from the development of the placenta in relation to the decidua reflexa which as pregnancy advances comes to cover the internal os. Placenta prævia is not infrequent in hospital practice. Thus at the Government Hospital for Women and Children Madras 132 cases of placenta prævia occurred among 20420 labours giving a proportion of 1 in 155.

Other conditions that may predispose to the development of placenta prævia are endometritis subinvolution of the uterus and low implantation of the tubes

Varieties The extent to which the placenta is inserted into the lower uterine segment varies greatly so that it is usual to classify this condition under three headings —

(a) Central (b) Marginal (c) Lateral

according as the placenta covers the entire internal os or reaches

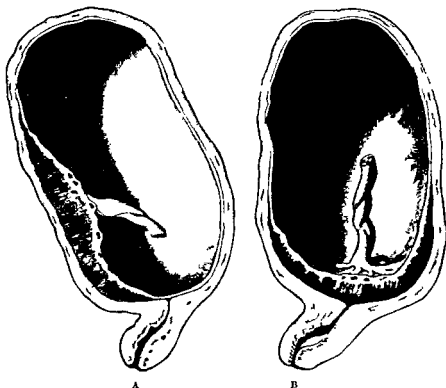


FIG 88—Placenta prævia

A marginal. B central.

up to its margin or merely dips into the lower uterine segment and is just within reach of the examining finger. It must be realised that these degrees depend on the dilatation of the os so that a supposed case of central placenta prævia at the onset of labour will appear to be of the marginal variety when the cervix is two fifths dilated. A more rational classification of the varieties of placenta prævia would be to divide them into complete and incomplete varieties—the complete variety being characterised by the placenta being almost wholly in the lower uterine segment

and covering the undilated internal os by its central and thickest part. The incomplete varieties are those already referred to as the marginal and lateral varieties.

Clinical Features The most characteristic feature of this condition is that hæmorrhage occurs without any warning and is unassociated with pain. A painless, apparently causeless hæmorrhage occurring in the third trimester of pregnancy, perhaps when the patient is actually sleeping, is very characteristic of placenta

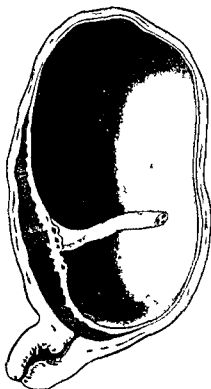


FIG. 89.—Partial placenta prævia

prævia. Occasionally, however, the hæmorrhage occurs after some effort, such as straining at stool or lifting weights, or from jolting such as results from an automobile journey over rough roads.

The commonest time for hæmorrhage to occur is during the last ten or twelve weeks of pregnancy. Sometimes it may occur much earlier, and there is no doubt that some cases of abortion and miscarriage are really due to placenta prævia.

The initial hæmorrhage may be slight and may cease suddenly only to appear at irregular intervals, on the other hand it may be so severe that the patient is soon *in extremis*. In some cases

although the hæmorrhage stops a slight serosanguineous discharge may continue promoting a degree of anæmia which may severely undermine the general health of the patient

The hæmorrhage is due to the detachment of the placenta and comes from the open placental sinuses. Occasionally it may also be from a rupture of the circular sinus of the placenta. In some cases the separation may be initiated by the same cause which gave rise to accidental hæmorrhage, that is, diseased conditions of the uterus probably associated with toxæmia. The extent of the hæmorrhage depends upon the variety of the placenta prævia, the term of pregnancy at which the hæmorrhage occurs, the readiness with which treatment is available and the method of treatment adopted.

Diagnosis. Placenta prævia as a rule is not difficult to diagnose. Indeed the only other condition with which it may be mistaken is accidental hæmorrhage. It should always be suspected when any hæmorrhage occurs in the later weeks of pregnancy.

On abdominal palpation the pre-enting part may not be fixed and there is frequently a malpresentation. In rare cases it may be possible to feel a doughy swelling just above the symphysis pubis. The diagnosis however, rests entirely on a vaginal examination and it cannot be sufficiently emphasised that in every case of hæmorrhage occurring during pregnancy no diagnosis should be attempted without such an examination. If one feels placental tissue with the examining finger inserted through the cervical canal a diagnosis of placenta prævia can be definitely made otherwise it is reckoned as a case of accidental hæmorrhage. Where hæmorrhage has occurred from a placenta prævia the os is usually sufficiently dilated to allow the finger to be passed through so that the placenta can be easily recognised. The placenta is firm and rough pits on pressure and is not soft and smooth and friable like blood clot. Occasionally cancer of the cervix complicating pregnancy may be mistaken for placenta prævia. In the author's experience the only other condition for which placenta prævia was mistaken was a hydatidiform mole where the house surgeon attempted in vain to perform internal podalic version mistaking the soft hydatidiform mole for placenta prævia.

Another sign of some importance is that if a careful examination be made of the membranes even when the placenta is not within reach it will be found that they are somewhat gritty when the placenta is low down instead of being smooth and slippery. After delivery if the after birth be examined it will be found that the rent in the membranes is close to the margin of the placenta.

A sign that can occasionally be made out when the cervix is not dilated sufficiently is the doughy feel on the dome of the vagina and the soft pitting sensation that can be experienced by pressure on one or other of the fornices.

Differential Diagnosis The chief condition with which placenta prævia may be confused is *abruptio placentæ* and the most certain method of differential diagnosis is by vaginal examination. If placental tissue is not felt by the finger inserted through the cervical canal the case may for all practical purposes be treated as one of *abruptio placentæ*. Other conditions which might cause hæmorrhage during this period of pregnancy are cancer of the cervix, erosion of the cervix, mucous polypi, varicose veins round about the cervix and vagina and traumatic causes involving lacerations of the cervix or lower segment of the uterus. A clear elucidation of the history together with the vaginal findings will help in settling the diagnosis.

Occasionally placental tissue may be mistaken for blood clot for the presenting part in foetal monstrosities such as anencephaly, exomphalos, meningocele and spina bifida. The differential diagnosis between placental tissue and blood clot has been described above. Other conditions can be differentiated by a careful examination if necessary with the patient under anæsthesia. Occasionally a visual examination with the help of a speculum may be of advantage.

Complications Several complications may arise as a result of placenta prævia. Among the commoner are malpresentations, premature labour, prolapse of the cord and uterine contractions, etc.

During Pregnancy Greater tendency for abortion or miscarriage, malpresentations and malpositions, onset of premature labour.

During Labour

First stage Weak uterine contractions, delayed engagement of the presenting part.

Second stage Prolapse of the cord, abnormalities in rotation in cephalic presentations, prolonged labour and greater necessity for artificial assistance, lacerations of the cervix.

Third stage Postpartum hæmorrhage either from lacerations or atony of the uterus, adherent placenta.

Later *during the puerperium* the patient may run the risks of puerperal sepsis, subinvolution, phlebitis and chronic endometritis.

Prognosis The prognosis is unfavourable for the mother and child. The mortality varies in different circumstances. If the case is seen early and effective assistance rendered the mortality, especially the maternal, will be markedly decreased.

The foetal mortality is always great in this condition partly due to prematurity and partly due to the great loss of blood. The foetal mortality depends upon—

- (1) The period of pregnancy at which the hæmorrhage occurs
- (2) The degree of placenta prævia
- (3) The amount of hæmorrhage before assistance is obtained.
- (4) The method of treatment adopted
- (5) Whether the patient is a primipara or a multipara
- (6) The condition of the cervix, that is, whether the cervix is soft and easily dilatable, and the extent of dilatation

So far as the mother is concerned the prognosis depends on the variety of placenta prævia, the central being far more dangerous than the lateral the condition of the patient on admission, the period of pregnancy and the presence or otherwise of any complications such as toxæmia, contraction of the pelvis, anæmia and other general diseases. A repetition of placenta prævia in subsequent pregnancies is very rare.

Treatment The objects we have in view in the treatment of this condition are —

- (1) To arrest the hæmorrhage
- (2) In the majority of cases to promote labour and complete delivery
- (3) To prevent postpartum hæmorrhage
- (4) To treat the shock, collapse and the anæmia resulting from the hæmorrhage

Certain general considerations may now be stated. Placenta prævia may give rise to hæmorrhage at any period of pregnancy during the last trimester. The termination of pregnancy, considerably in advance of term, will naturally adversely affect the chances of foetus surviving. In certain mild cases of hæmorrhage may we therefore temporise and so prolong the period of intra uterine life of the foetus? The hæmorrhage in a case of placenta prævia recurs at irregular intervals, and it is impossible to anticipate the extent of the subsequent hæmorrhage which is bound to occur. Accordingly temporising is undoubtedly attended with grave risks to the mother, but in exceptional cases one may take the risk. This however should only be done in institutions where constant observation day and night is available and where adequate assistance can be given without any delay. In all other cases the interests of the mother are so paramount and the chances of the survival of the foetus, particularly in the earlier periods of the last trimester so negligible, that it is justifiable to terminate pregnancy, and this usually results from the methods of treatment adopted to check the hæmorrhage.

The *expectant method* of treatment may be adopted in those

cases where the patient has had but one single hæmorrhage, not of a severe nature, and the child is viable. In such cases the routine is to put the patient to bed, give her complete rest, a small dose of morphia, $\frac{1}{4}$ grain, or other opiate may be given. The patient should be on a bland liquid diet, the bowels should be emptied with glycerine enemata if necessary, and uterine sedatives such as bromides may be administered, together with calcium lactate to increase the coagulability of the blood. This method of treatment may possibly help in preventing a further immediate hæmorrhage and the patient should be transferred as soon as possible to a maternity institution so that she may be under constant observation. Should however, a fresh attack of hæmorrhage occur conservative measures must be abandoned and one of the active methods of treatment to be outlined later adopted. But the advantage of the expectant regime is that even a few days gained increases the possibilities of survival of the fœtus after delivery.

Where active methods of treatment are instituted for placenta prævia, it may be by any one of the following methods —

- (1) Rupture of the membranes
- (2) Rupture of the membranes and injections of pituitary extract
- (3) Vaginal tamponage
- (4) Braxton Hicks' method of bipolar version
- (5) The use of the metreurynter
- (6) Willett's forceps
- (7) Immediate delivery by internal podalic version and extraction, or in some rare cases with forceps
- (8) Cæsarean section—vaginal or abdominal.

We may state here that considerable judgment is needed in selecting the particular method of treatment which should be adopted for a particular case. It may be stated that *accouchement forcé* that is, forced or rapid delivery associated with rapid artificial dilatation of the cervix, has no place in the treatment of placenta prævia. The cervix in this condition has been aptly compared to a piece of wet blotting paper and tears so easily if subjected to any forcible dilatation that such methods must unhesitatingly be condemned.

1 Simple Rupture of Membranes In a certain number of cases, particularly the marginal or lateral varieties of placenta prævia, and in multipara with a soft dilated cervix where the uterine contractions are already in progress simple rupture of the membranes, with application of a tight abdominal binder allows the presenting part to fix in the brim of the pelvis and thus compress the placental site so arresting hæmorrhage and facilitating the progress of labour.

2 Rupture of the Membranes and Injections of Pituitary Extract This method is exceedingly useful in those cases where with a soft dilatable cervix in the condition of placenta prævia marginalis or lateralis the uterus is not contracting properly or effectively provided there is no disproportion between the presenting part and the pelvis and no malpresentation exists. It should therefore be used where the vertex presents generally in a multipara occasionally in some cases of primipare also the

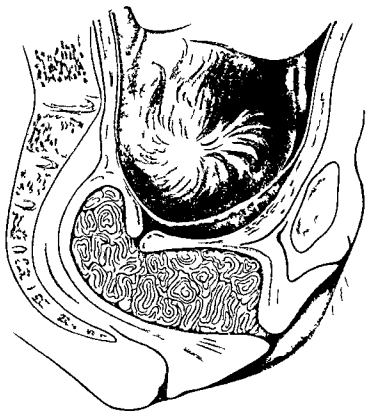


FIG 90 —Plugging of the os in placenta prævia

cervix being nearly three fifths dilated or soft and dilatable. The membranes are ruptured and the patient is given $\frac{1}{2}$ to $\frac{1}{4}$ cc of pituitary extract and a tight abdominal binder applied. Uterine contractions are provoked by which the presenting part is fixed and the placental site is compressed thereby checking the hæmorrhage. Labour is often terminated spontaneously without further complication.

3 Vaginal Tamponage The method of vaginal plugging has obvious disadvantages and should only be adopted as an emergency measure in those cases where other methods of

treatment are not immediately possible. The disadvantages of vaginal plugging are —

- (1) That it produces a certain amount of shock
- (2) That it increases the risks of sepsis which is already especially great in the condition of placenta previa owing to the low attachment of the placenta

On the other hand there is perhaps no method of treatment so readily available and so immediately effective as vaginal tamponage if properly done. As an emergency measure in outdoor practice to tide over the possibility of severe hæmorrhage till the patient is taken to an institution for treatment we believe that vaginal tamponage has a definite place in the treatment of placenta previa.

In certain cases also where the cervix is less than two fifths dilated and where from certain considerations only the vaginal route of delivery is decided upon it may be necessary to resort to vaginal tamponage as an intermediary measure before other methods can be adopted.

If vaginal tamponage is decided upon the same precautions should be taken as have already been described in the chapter on *abruptio placentæ* and the tamponage should be carried out in a similar manner.

It is advantageous in these cases to rupture the membranes before the tamponage is done and also to give small doses of pituitary extract— $\frac{1}{2}$ c.c. if the uterus is not contracting.

4 Braxton-Hicks Method of Bipolar Version. If this method is to be successful the os should be sufficiently dilated to admit two fingers. Bipolar podalic version is done if the presentation is not already a breech. The membranes are then ruptured and a foot grasped by the fingers and brought down through the cervical canal. The half breech compresses the placenta against its site and arrests the hæmorrhage. Occasionally it may be useful to tie a loop of sterile gauze round the ankle of the fetus and attach to its other end a small weight of about 2 lbs. and suspend it over a pulley fixed on to the foot of the bed. By such traction on the leg the half breech constantly compresses the placenta against its site and so controls hæmorrhage. The half breech not only arrests the hæmorrhage but stimulates the uterus to contract, and in course of time spontaneous delivery is facilitated.

This method of treatment may be adopted if the woman has lost much blood, the fetus is dead or dying or very premature or if the operator has only a limited experience. After controlling the hæmorrhage by bringing down a leg do not extract the child because the cervix is not dilated and tears will occur followed by shock, hæmorrhage and later on sepsis. For the same reason do

not give pituitary extract and do not apply traction on the leg unless bleeding recurs. If bleeding recurs slight traction on the leg may be sufficient and once the hæmorrhage has been arrested measures can be adopted to replace the blood loss.

The obvious disadvantage of this method of treatment is that it still further reduces the chances of the child surviving. Where

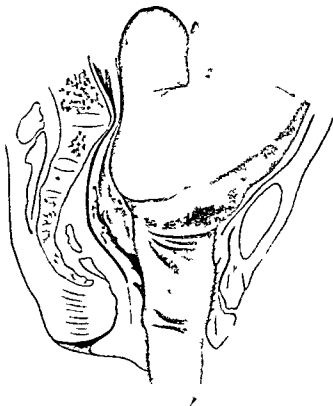


FIG. 91.—Braxton Hicks method of treatment in placenta prævia.
Note the half breech compressing the placenta.

therefore the foetus is alive and might reasonably be saved other methods of treatment should be adopted.

5 The Use of the Metreurynter Hydrostatic dilators of various types have been used in the treatment of placenta prævia and the most common and useful of these is Champetier de Ribes bag. The objects of introducing these hydrostatic dilators are —

- (1) To arrest the hæmorrhage by pressure on the placental site
- (2) To provoke uterine contractions
- (3) To dilate the cervix uniformly

- (4) To take the place of the bag of membranes and thus prevent further escape of liquor amni
- (5) To stretch the vaginal canal and completely dilate the os, so that further delivery may be easy

Champetier de Ribes' bag is made of oiled silk and ordinarily measures about 9 cm ($3\frac{1}{2}$ ins) at its widest diameter when distended

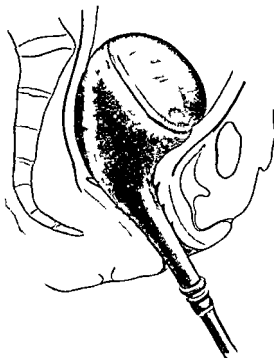


FIG. 97.—Champetier de Ribes bag in situ

with fluid. The bag is used in other conditions besides placenta prævia such as—

- (1) Premature rupture of the membranes
- (2) Imperfectly dilated cervix
- (3) In cases of prolapse of the cord with a partially dilated cervix where it is used after reposition of the cord
- (4) As a method of dilating the vagina

The precautions to be taken in the use of the bag are

- (1) The bag should be tested to see that it is not leaking
- (2) The capacity of the bag should be definitely ascertained before introduction
- (3) The bag should be sterilised before use
- (4) The cervical os should be dilated at least two fifths
- (5) The membranes should be ruptured before the bag is introduced

There is a special instrument used for the introduction of this bag called the Champetier de Ribes bag introducer. When the bag is to be used the patient is placed in the lithotomy position the external genitalia are cleansed the usual antiseptic precautions are taken a posterior vaginal speculum is inserted the cervix is steadied with a sponge forceps and after folding the bag and holding it by means of the introducer the membranes having been ruptured previously the bag is inserted through the cervical canal past the internal os so that at least two thirds of the bag lies beyond the internal os. The bag is next filled with a fluid—any mild antiseptic or sterile fluid may be used for this purpose. A Higginson's syringe is attached to the rubber tubing connected to the bag and the fluid is pumped in. After the bag is partially filled the introducer may be separated and gradually removed the two blades being taken out separately as in the removal of an obstetric forceps after delivery. When the bag has been completely filled the stop-cock is closed a weight not exceeding 2 lbs is tied to the end of the tube and suspended over a pulley fixed to the foot of the bed. If uterine contractions are present it may not be necessary to attach the weight but in the absence of such contractions it is desirable to use a weight so attached. It is necessary to relieve the traction of the weight at intervals of fifteen minutes so that the constant pressure and the pull exerted may not unduly compress the birth canal and so lead to ischæmic necrosis. The bag should not be left in longer than eight hours and if labour pains have not progressed it is better to empty the bag remove it reintroduce it or decide on some other methods of treatment to be adopted. But where uterine contractions supervene and labour proceeds satisfactorily the bag is gradually expelled into the vagina. It is wise to be on the lookout for this as before the head descends the placenta is no longer compressed and hæmorrhage may once more occur and the blood collecting above the bag result in a severe form of collapse. Once the bag is expelled through the cervical canal it should be removed and labour terminated by breech extraction podalic version and extraction or forceps delivery.

6 Willett's Forceps Willett in 1925 showed that by means of a special forceps which he had devised traction could be applied to the foetal head so as to exert pressure on the placental site and thus arrest hæmorrhage. The forceps is passed through the internal os and the scalp grasped. A tape is attached to the handle of the forceps and suspended over a pulley by a weight at its other end. Thus pressure is exerted continuously and dilatation of the cervix is facilitated so that labour progresses resulting in spontaneous vaginal delivery.

The cases most suitable for this form of treatment are vertex presentations with a marginal or lateral placenta previa where

the cervical dilatation admits two fingers. The forceps is passed through the dilated os after rupture of the membranes and pressed against the head, which is kept in position by an assistant *steady ing it from above*. The forceps then grasps a portion of the scalp. A weight of 1 or 2 lbs. is attached to the handle of the instrument by a tape, which is then slung over a pulley at the edge of the bed.

This method of treatment is fairly simple and effective in suitable cases. We do not think it is of much service in cases of central placenta prævia, nor would we advocate this method of treatment where, because of the severity of hæmorrhage more

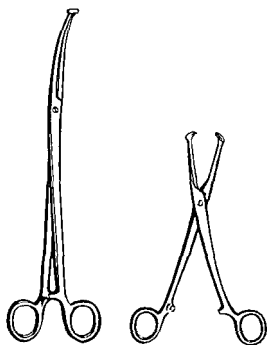


FIG. 92a—Willett's forceps. Two sizes.

urgent measures of treatment are needed. Obviously Willett's forceps is not of use unless the presentation is a vertex and there is no disproportion between the pelvis and the cephalic pole.

In some cases where the foetus is dead and the presentation is a vertex, the application of Willett's forceps with traction is not sufficient to effectively compress the placental site and favour descent. This may be due to causes such as deflexion attitudes of the foetus or to some degree of pelvic contraction. In such cases continuous slight oozing will occur. Under such circumstances it will be found useful to perforate the cephalic pole, apply a cranioclast and exert traction on it by a weight not exceeding 2 lbs. attached by a piece of tape and suspended over a pulley as in the

case of Willett's forceps. The hæmorrhage is arrested by the descent of the head and delivery occurs spontaneously.

7 Immediate Delivery We advocate this method of treatment only in those cases where all conditions necessary are present for a safe immediate delivery. It is not suggested that any forcible measures should be adopted to promote immediate delivery. Where the os is fully dilated instead of allowing slow hæmorrhage to continue we think it is preferable to terminate labour immediately by internal podalic version and extraction if the head is not engaged in the brim of the pelvis or by extraction in

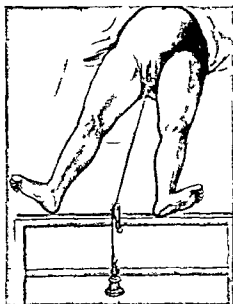


FIG 9 b Willett's forceps *in situ* in a case of placenta prævia.
Note the position of the pulley and weight.

cases of breech presentation or by the application of forceps in those cases where the head is already engaged.

A word of caution should however be mentioned in this connection because the application of forceps unless done when the cervix is fully retracted above the presenting part and every care is employed is likely to lead to considerable trauma and cause further hæmorrhage besides predisposing to infection.

In some cases after performing internal podalic version and bringing down a foot it may be advisable to leave the completion of labour to natural powers.

8 Cæsarean Section Cæsarean section has now come to occupy an important place in the treatment of placenta prævia. It may be done either by the abdominal or the vaginal route.

So far as the abdominal route is concerned the conditions under which this operation may be necessary or deemed advisable are —

- (1) In an elderly primipara where the cervix is rigid and not easily dilatable
- (2) In many cases of central placenta prævia where the fœtus is alive particularly at or near term
- (3) In multiparæ where the cervix due to previous injuries is cicatrized fibrosed and not easily dilatable and the placenta is either central or lateral it is much better in these cases to deliver the child by an abdominal Cæsarean section than to attempt any vaginal mode of delivery
- (4) In all cases of placenta prævia complicated by cephalo pelvic disproportion
- (5) In cases where the saving of the fœtal life is of considerable importance it is much better not to run the risks of fœtal asphyxia or fœtal death by vaginal modes of delivery
- (6) Where complications such as fibroids exist in association with placenta prævia the abdominal route is undoubtedly the best

In cases of severe hæmorrhage where immediate arrest is impossible by the usual vaginal methods of treatment it may occasionally be more beneficial to perform a Cæsarean section. Wherever possible the lower segment Cæsarean section is advisable but in some cases where prompt delivery is important or where the operator is not quite familiar with the technique of lower segment Cæsarean a classical section is preferable.

Where the patient has already been examined or treated outside and the chances of sepsis are therefore considerable Cæsarean hysterectomy may have to be considered.

Occasionally if at Cæsarean section hæmorrhage cannot be easily controlled the necessity for an immediate hysterectomy may again have to be considered.

Vaginal Cæsarean Section Essen Möller has advocated this method of treatment particularly in view of the fact that there is less chance of infecting the peritoneum and less shock to the patient. It can also be adopted in those cases where other methods of treatment through the vaginal route have not been found successful. It is not a method that can be recommended to the beginner as to be successful the operator requires to have had a considerable experience in the technique of vaginal methods of delivery and of vaginal operations but there are most certainly

cases where this type of operation will considerably improve the prognosis. The details of the operative technique will be discussed in the chapter on operative obstetrics.

Whatever may be the line of treatment that is adopted two things must be kept in view: (1) the necessity to treat the collapsed condition in which the patient is generally found, and (2) the arrest of postpartum hæmorrhage that is so likely to occur after delivery. Before any method of treatment outlined above is adopted the patient should first be treated for collapse. Intravenous injections of saline, or transfusion of blood either whole or citrated are most valuable. Cases of postpartum hæmorrhage occasionally show delayed collapse so that before starting any manipulative interference it is wise as a matter of routine to give the patient a transfusion. Other methods usually adopted for the treatment of collapse should also be followed.

Complications. Complications in a case of placenta prævia are hæmorrhagic collapse, lacerations of the cervix, shock and sepsis. Collapse and shock are in a measure inevitable but their severity can be very much lessened by adopting suitable methods of treatment as outlined above. Lacerations of the cervix ought to be avoided by care in vaginal examinations by conservative methods of delivery and by the utmost precaution in the use of any instruments or bags in the treatment of this condition. Sepsis is a troublesome sequel if it occurs and too great care cannot be taken in trying to avoid it by not resorting to frequent vaginal examinations and manipulations and by scrupulous antiseptic precautions at every stage of the treatment and delivery of the patient.

De Lee has laid down the excellent axiom that no woman with placenta prævia should die except in the very rare instances of air embolism, hæmorrhagic diathesis or spontaneous rupture of the uterus. In our experience hæmorrhagic diathesis and spontaneous rupture of the uterus are exceedingly rare and we would subscribe to this axiom if the patient has summoned medical help as soon as the first flooding occurs and her general condition then is not unsatisfactory. Cases of anæmia with placenta prævia present problems in the method of treatment which so far baffle all possibilities of solution. In some cases of extremely lowered vitality with one or other of the tropical diseases such as malaria, kala azar, tubercular diarrhœa, pernicious anæmia of pregnancy, or the devitalised patient resulting from malnutrition and avitaminosis, placenta prævia affords a convenient apology for the terminal event of life despite every method of treatment possible.

SECTION II PATHOLOGY OF LABOUR

CHAPTER XXVI DYSFOCIA IN LABOUR

The term *dystocia* is used to signify the condition where some difficulty is experienced in parturition. Eutocia on the other hand is the term which implies normal labour. There are several conditions on the part of the fœtus and on the part of the mother which may give rise to dystocia.

Dystocia from fœtal causes may be due to —

- (1) Faulty attitude
- (2) Faulty position
- (3) Faulty presentation
- (4) General fœtal conditions

Dystocia due to maternal causes may be due to any of the following factors —

- (1) The forces of labour
- (2) The parturient tract and adnexa
- (3) General maternal conditions

We shall first take up the fœtal causes underlying dystocia.

DYSTOCIA DUE TO FAULTY ATTITUDE

The normal attitude of the fœtus in the uterus is one of universal flexion. In cephalic presentations therefore if the attitude of flexion is deviated from in any respect difficulties may arise in the course of delivery. The normal degree of flexion may be either increased or diminished within certain limits.

The normal degree of flexion results in a *vertex* presentation where that part of the fœtal skull which lies between the anterior and posterior fontanelles presents.

(1) Excessive flexion gives rise to the condition which will later be described as *Roederer's obliquity* where the presenting part is the occipital bone.

(2) If the flexion is incomplete to a slight degree only the bregma or *anterior fontanelle* will be the presenting part.

(3) If instead of flexion a minor degree of extension occurs and the head occupies a position midway between full flexion and complete extension the brow or the region between the bregma and the glabella presents giving rise to a *brow presentation*

(4) If the extension is still more pronounced the area between the frontal eminences and the superior maxilla presents a condition to which we have applied the term *glabellar presentation* as the glabella is the mid point of the presenting part

(5) If complete extension takes place a *face presentation* results

(6) Should the head be tilted towards one or other shoulder one of the parietal bones may be leading. If the anterior parietal bone is the lowest part the term anterior parietal presentation or *Vacquier's obliquity* is applied. Should however the posterior parietal bone be the lowest part the condition is known as posterior parietal presentation or *Litmann's obliquity*



FIG. 93.—Posterior fontanelle presentation (Roederer's obliquity)

Roederer's Obliquity

Excessive flexion of the head upon the trunk in a cephalic presentation has been termed Roederer's obliquity. This is nothing more than an exaggeration of the normal flexion of the head during labour

whereby the occiput enters the inlet perpendicularly. The causes of this condition are —

- (1) Excessively large foetal head especially in a dead or macerated foetus
- (2) A generally contracted pelvic inlet
- (3) Excessive rigidity of the cervix.

Diagnosis is generally made only by a vaginal examination when the occipital bone is felt as the most dependent part and the bregma is unusually high

Prognosis Difficulty in the engagement of the head at the pelvic inlet causes delay in labour but once it has occurred the condition does not usually cause dystocia. Indeed the degree of dystocia is usually so slight that in the majority of cases labour will take a normal course. In view of the greater need for instrumental assistance and the conditions responsible for this presentation the prognosis is a little unfavourable

Treatment Owing to the prolongation of the stages of labour, application of forceps may sometimes be necessary to deliver the fetus

Anterior Fontanelle Presentation

This condition is the result of a partial extension of the head, whereby the bregma or the large fontanelle becomes the most dependent part of the cephalic pole

Ætiology It may be due to the same causes as promote a brow or a face presentation. It is one of the important factors in the production of prolonged and tedious labour either because of delayed internal rotation due to incomplete flexion or because a longer diameter tries to engage at the brim of the pelvis and in consequence the occipito frontal circumference instead of the sub occipito bregmatic circumference is brought into relation with the pelvic cavity

The condition is generally associated with (1) flat pelvis (2) occipito posterior presentations and (3) a relatively large head producing conditions corresponding to a flat pelvis with a normal head

Mechanism The mechanism differs from that of a normal vertex presentation because the imperfect flexion brings the sinciput down in advance of the vertex thus interfering with internal rotation. Moulding is excessive by reason of the delay. The occipito frontal diameter tries to engage instead of the sub occipito bregmatic diameter. Engagement and descent are slow by reason of the greater circumference involved and internal rotation of the head either fails or is accomplished with great difficulty and much damage to the maternal soft parts because the vertex and forehead are equally influenced by the factors causing rotation. Labour may often come to a standstill by reason of the transverse position of the occipito frontal diameter on the pelvic floor. The perineum may be badly lacerated and may begin to tear even before the head has reached it because of over distension of the vagina causing lacerations which extend externally to the perineum

Diagnosis A vaginal examination reveals that the large fontanelle can be palpated with ease

Prognosis If the condition is recognised and proper treatment

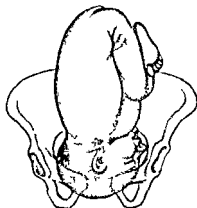


FIG. 94 — Anterior fontanelle presentation

adopted the prognosis is not unfavourable. If overlooked all the dangers of tedious labour and secondary inertia may ensue.

Treatment Immediate correction of the incomplete flexion should be made by one of two methods —

- (1) Pushing up the forehead during uterine contractions with two fingers in the vagina while the other hand steadily applies pressure upon the fundus in the direction of the occiput.
- (2) The whole hand may be introduced into the vagina and either the occiput drawn down or the forehead pushed up counter pressure being at the same time applied upon the breech of the fœtus at the fundus.

If the condition is recognised late in labour attempts at flexion may fail or the case may require urgent delivery and the application of forceps be called for.

Occipito-Posterior Positions

In a vertex presentation the occiput may be posterior and lie either on the right side of the pelvis or on the left side—the right occipito posterior position being more common. The condition is frequently met with and statistics show that in 25 to 30 per cent of vertex presentations the position is occipito posterior.

Mechanism In a favourable case the mechanism differs from that of an occipito anterior only in the distance through which the occiput has to rotate namely three-eighths of a circle or 135° instead of one-eighth of a circle or 45° . This difference however is a matter of considerable importance as an occipito posterior in trying to rotate may come to occupy one of four positions —

- (1) The occiput may fail to rotate altogether and may lie in the position in which it first entered the pelvis that is opposite the sacro iliac synchondrosi. It is then known as *persistent occipito posterior*.
- (2) Partial rotation of the occiput may occur rotation occurring through only 45° and the sagittal suture comes to lie in the transverse diameter of the pelvis.
- (3) The occiput may rotate and become an occipito anterior, but the rotation falls short of a complete rotation into the antero posterior diameter of the pelvic outlet and delay is thus encountered.
- (4) *Reverse rotation* of the occiput may take place and the occiput comes to lie in the hollow of the sacrum. This is also a variety of persistent occipito posterior position.

Unless an anterior position is produced spontaneously some degree of dystocia results as incomplete flexion of the head has persisted and so called larger diameters to present.

Diagnosis An occipito posterior position is usually easily diagnosed by abdominal palpation if the uterine and abdominal walls are not too tense. The fetal limbs are more easily felt than usual and lie nearer the middle line of the body and on either side of the umbilicus, the head may not be engaged in the pelvis. Auscultation reveals that the point of maximum intensity of the fetal heart sounds is generally in one or other of the flanks much lower and farther out than in an anterior position.

On vaginal examination the presenting part may be found rather high, the sagittal suture is in one of the oblique diameters.



At a later stage when there is difficulty in palpating the fetal parts owing to strong uterine contractions and help at delivery is required an occipito posterior presentation may be suspected by the vaginal findings and under the following conditions —

- (1) Greater difficulty in the introduction of the blades of the forceps
- (2) Difficulty in locking the blades as the handles of the forceps do not approximate as usual
- (3) Tendency for rotation of the forceps to occur on traction
- (4) Tendency for the forceps to slip causing stretching of the vaginal walls lower down
- (5) Overstretching of the vagina as the head descends resulting in a severe degree of laceration of the perineum if the head is delivered with the occiput still posterior

Course of Labour In occipito posterior cases labour is usually prolonged because of a misfit between the pelvis and the presenting part. The foetus tends to assume the military attitude of slight extension in which the head participates so that the suboccipito frontal ($4\frac{1}{4}$ ins) or occipito frontal diameter ($4\frac{1}{2}$ ins) attempts to engage in the brim instead of the suboccipito bregmatic diameter ($3\frac{3}{4}$ ins). Again instead of the bitemporal diameter ($3\frac{1}{4}$ ins) the biparietal diameter ($3\frac{3}{4}$ ins) lies in the sacrotuberous diameter of the pelvis which runs from the promontory of the sacrum to the iliopectineal eminences. This means that larger diameters than are met with in occipito anterior positions attempt to engage and explains the delay as well as the frequency of non-engagement of the head at the beginning of labour.

Once the head does engage descent is slow and internal rotation is therefore delayed for it cannot occur till the head reaches the pelvic floor. Further the misfit makes the initiation and completion of the movement difficult. These factors cause delay for once complete rotation has been made possible by the head becoming properly flexed and thus the smaller suboccipito bregmatic diameter substituted for the large occipito frontal diameter the movement is accomplished rapidly.

If the head descends as a persistent occipito posterior it overdistends the vagina and reflexly produces very powerful uterine contractions which may succeed in effecting a spontaneous delivery although more usually the aid of forceps is required. Delivery face to pubes always results in deep vaginal and perineal lacerations which may involve the rectum because of the overstretching of vagina and vulva.

Prognosis Owing to the delay caused and the greater amount of moulding and pressure to which the head is subjected

in the course of labour, the prognosis for the fetus is more unfavourable than in an occipito anterior position. The longer duration of labour, the increased frequency of vaginal examination necessary, the greater tendency for laceration of tissues and the need for assistance and particularly instrumental delivery, all increase the mother's risks and make the prognosis a little more unfavourable. Consequent upon the delayed labour postpartum hæmorrhage may occur and further increase the risk for the mother.

Treatment This depends upon the stage at which the case is seen. In view of the fact that an occipito posterior position may sometimes result in a reverse rotation of the occiput and cause delay in labour, thus increasing the risks to the fetus, attempts should be made in the later weeks of pregnancy to promote a more favourable position.

This can be done by the method of abdominal manipulation recommended by Brist. The back of the fetus is brought to the front as much as possible and then two pads are applied, one just behind the back of the fetus, the other on the opposite side, and a tight abdominal binder applied. The pad applied behind the back presses it forward while the other applied on the opposite side pushes the limbs posteriorly, and thus forward rotation of the back of the fetus is favoured.

If the patient is seen after the onset of labour the treatment will depend upon the stage of labour and the progress of the head along the birth canal.

A Early in Labour and before the Membranes have Ruptured Anterior rotation of the occiput may be favoured by postural treatment. The woman may be made to lie on the side to which the occiput is pointing. In cases of right occipito posterior the woman would lie on the right side and in cases of left occipito posterior on the left side. With postural treatment it is advantageous to apply an abdominal binder and in some cases pads may be applied on either side as suggested by Brist.

When a case of occipito posterior is met with care must be taken to see that the position is not due to any serious disproportion between the head and the pelvis or any factor causing obstruction to the advance of the head, and if any such factors are present the treatment will depend upon the degree and nature of the disproportion or the factor concerned in obstruction. It is also desirable in occipito posterior positions not to allow the patient to walk about in the first stage of labour as frequently, owing to the head not fixing properly at the brim of the pelvis, the membranes rupture prematurely and sometimes the cord may prolapse—complications which add to the difficulties of delivery.

Where an occipito posterior position is recognised at the onset of labour it is important to remember that given time, the natural tendency is for the head to rotate anteriorly. Premature attempts at interference will only lead to a greater amount of difficulty in the extraction of the head and injuries to the child and the mother and must therefore be avoided.

B After the Membranes have Ruptured A method of treatment that will be found suitable in cases where the occiput is posterior and the head has not entered the brim of the pelvis is to perform internal podalic version and extract the foetus if necessary. We commend this method particularly in cases of multiparae where there is no relative disproportion between the head and the pelvis and where the condition is frequently not diagnosed till late in labour, with the cervix nearly fully dilated and the head still arrested above the brim of the pelvis. This method may also be useful in cases of flat pelvis of a moderate degree where the after coming head favours ease of delivery more than the fore coming head.

If however the occipito posterior position is met with at a later stage in labour, when the head has partially descended into the cavity the occiput may be arrested at any stage of its rotation to the front or in some cases reverse rotation of the occiput may take place and the occiput may actually lie in the hollow of the sacrum. The treatment will therefore necessarily depend to a certain extent upon the position of the occiput in the pelvis and also upon any disproportion that may be present between the foetal head and the pelvis. If there be no disproportion in a majority of cases the occiput will rotate to the front provided sufficient time is given and the uterus is encouraged to contract adequately. The patient should under these circumstances be kept at rest given sedatives to alleviate suffering and yet permit of full dilatation of the cervix so that she may not become exhausted by the prolongation of labour. Glucose fruit juice and any refreshing drinks, along with a chloral and bromide draught or small doses of morphine with hyoscine, may be of considerable help in promoting a certain amount of sleep after which the patient will probably awake refreshed and the uterine contractions will be more effective. Should however, internal rotation not take place or reverse rotation occur in spite of the treatment outlined above, it may be necessary to interfere and help forward rotation of the occiput. This may be done by any of the following methods —

(1) By favouring increased flexion by pushing the sinciput up or bringing the occiput down, by means of fingers introduced into the vagina. Simultaneously with this, pressure is applied to the fundus towards the occipital pole so as to promote a greater degree of flexion.

(2) In cases where the uterine contractions are not sufficiently strong it is advisable to give a small dose of pituitary extract ($\frac{1}{2}$ c.c.) particularly if the dilatation is nearly complete as in such cases the increased force of uterine contraction tends to sweep the occiput to the front even if forward rotation is not complete once the occiput tends to move forward subsequent delivery will be rendered easy and forward rotation can be helped by any of the manœuvres to be suggested later

It may in this connection be stated that two of the fundamental factors that prevent forward rotation of the occiput are (a) weak uterine contractions and (b) laxity of the pelvic floor due to old lacerations in multipare. Other factors that might hinder the rotation of the occiput forward are cord round the neck a large sized baby a loaded rectum or distended bladder or a hand nipped by the side of the head or pressed against the chin of the fetus interfering with the movement of internal rotation

(3) Anterior rotation of the occiput may be favoured by the introduction of the half hand into the vagina with the patient under an anæsthetic and forward rotation of the occiput attempted by grasping the head between the thumb and the fingers and gradually bringing it to the front. Simultaneously with this manipulation it is desirable that the other hand should be applied to the anterior abdominal wall behind the anterior shoulder and the shoulder pushed in the same direction. An assistant may sometimes perform this manœuvre while the operator is trying to rotate the occiput forward via the vaginal canal

In some cases where the uterus is not tonically contracted and the head is wedged in the pelvis the occiput may be gently pushed up a little to aid forward rotation by the half hand

(4) If however these methods do not succeed or if the occiput rotates backwards and the necessity for interference is urgent owing to the condition of the fetus or mother the following mode of delivery may be attempted —

- (a) Rotation with the half hand and the application of forceps. In some of these cases after rotation by the hand and before the forceps is applied the occiput may tend to slip back. In the majority of cases however after the occiput has been rotated to the front it can be steadied by the palm applied posteriorly while the blade of the forceps is slipped in and is kept in position by an assistant. It is not necessary that the occiput should completely rotate to the front. In cases where reverse rotation has taken place and the occiput is absolutely posterior it should be dislodged from that position and brought forward at least to the transverse diameter of the pelvis that is through

90° complete, in which case forward rotation of the occiput will very often take place during the process of traction if gentle manipulations in that direction are used

- (b) In some cases where the half hand has not been able to rotate the head, rotation with the forceps may succeed.

Objection has been taken to the use of forceps as a rotator and it has been rightly emphasised that the main function of the forceps is that of a tractor. The obvious disadvantages of using the forceps as a rotator are —

- (i) That in the movement of rotation the blades of the forceps are likely to cause injury to the maternal soft parts resulting in lacerations of the vaginal wall.
- (ii) Bruising of the anterior vaginal wall leading to damage to the bladder may occur.
- (iii) Hematomas may be produced in the areolar tissue of the pelvis.
- (iv) The urethra may be stretched and lacerated.
- (v) The child's head and neck may suffer damage.

These dangers are very real if rotation with the forceps be tried in a mechanical manner so that the occiput is automatically carried to the front. The rotation that we advise is based on a different conception altogether. When the forceps is applied with the occiput in a posterior position and light traction made in the majority of cases there will be a tendency for the occiput to rotate *as a result of the head coming down slightly and pressing upon the pelvic floor*. The operator should wait and watch for this little movement and then gently aid it *by rotating the forceps as traction is applied*. Once the head has come down from the position in which it was almost impacted there will be a natural tendency for the occiput to rotate and it is this factor that ought to be taken advantage of in promoting rotation gradually with the forceps. There is no need to rotate the occiput completely to the front with the forceps and any slight degree of rotation forward will in the majority of cases considerably help in the delivery of the head by steady light traction. Occasionally, when the forceps is applied and traction made the occiput slips out suddenly face to pubes.

The dangers of the head being born with the occiput posterior are —

- (1) Extensive damage to the maternal soft parts particularly laceration of the perineum which may extend even into the rectum.

- (2) Damage to the foetal head which may be considerable and even if actual fracture of the bones of the skull does not take place tears of the meninges or intracranial hæmorrhages are not infrequent

Where the forceps is used in the manner suggested above to help forward rotation it may be necessary to remove the blades of the forceps and to reapply them before continuing traction as otherwise the forceps if applied with reference to the lateral walls of the pelvis having rotated into the antero posterior plane may cause damage to the urethra and the bladder

Where the foetal heart is not audible and the child is obviously dead there is no advantage in submitting the mother to unnecessary trauma and in such cases it is better to perforate the head when it is found that traction with forceps is not followed by an easy delivery

In some cases of occipito posterior position a further difficulty in the delivery of the foetus may be due to the formation of a contraction ring which prevents descent of the shoulders and delivery of the head through the outlet The treatment of this condition will be dealt with in the chapter on anomalies of the uterine forces

We do not consider it necessary to refer to such operations as Cæsarean section or pubiotomy in the treatment of uncomplicated cases of occipito posterior position as in our experience such operations are neither indicated nor warranted in the treatment of this condition In cases however where the condition is complicated by contractions of the pelvis the treatment must necessarily be modified and will depend upon the nature and degree of contraction This aspect of the complication will be dealt with elsewhere

CHAPTER XXVII

ABNORMAL CEPHALIC PRESENTATIONS

Anterior Parietal Presentation or Nægele's Obliquity

In a case of vertex presentation during labour both parietal bones descend simultaneously and the engagement is said to be *synclitic*. If however one or other of the parietal bones is in advance of the other the engagement is said to be *asynclitic*. In some cases the anterior parietal bone is in advance and the presentation is then called an *anterior parietal presentation Nægele's obliquity* or *anterior asynclitism*. In other cases the posterior parietal bone leads and the presentation is then known as a *posterior parietal presentation Lil mann's obliquity* or *posterior asynclitism*.

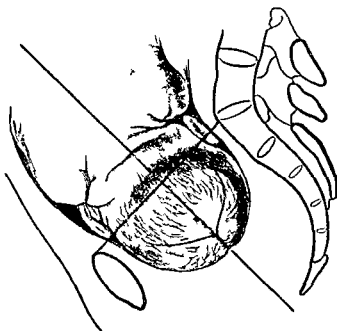


FIG. 96.—Synclitic engagement of the head

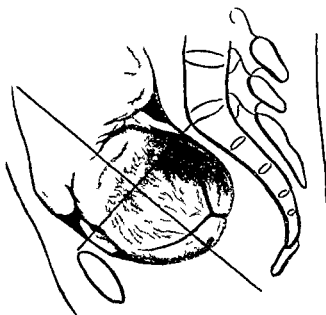


FIG. 97.—Anterior asynclitic position (Naegele's obliquity)

Ætiology Anterior asynclitism generally occurs—

- (1) Where there is a pendulous abdomen ;
- (2) In cases of flat pelvis ;
- (3) Due to any factor preventing latero flexion of the body of the fœtus

Diagnosis is generally made by vaginal examination, when it will be noted that the sagittal suture lies nearer the sacral promontory than the symphysis pubis, and the anterior parietal bone is the most dependent part of the vertex. The position of the sagittal suture with reference to the sacral promontory is an index of the extent of the disproportion between the pelvis and the foetal head. The nearer the sagittal suture is to the sacral promontory, the greater is the disproportion.

Prognosis depends entirely upon the cause of the condition. In minor degrees of pelvic contraction the prognosis is favourable as also when the anomaly occurs only temporarily due to causes which can easily be rectified. An anterior parietal presentation gives a much better prognosis than a posterior parietal presentation as in the former the posterior parietal bone will slip past the obstruction of the sacral promontory much more easily than the anterior parietal which has to overcome the resistance of the symphysis pubis in cases of posterior parietal presentation.

Treatment consists in the relief of the pendulous abdomen or anteverted uterus with an abdominal support or bandage or the treatment of any other causal factor such as contracted pelvis.

Posterior Parietal Presentation, or Litzmann's Obliquity

Here the sagittal suture approaches the symphysis pubis with the result that the posterior parietal bone or the ear becomes the presenting part. Incomplete flexion with the sinciput lower than the occiput is often present in addition. The condition usually occurs in markedly flattened pelvis, the obstruction resulting in a latero flexion of the foetal body and head. Only rarely does Litzmann's obliquity occur in a normal pelvis.

Diagnosis is made by palpating the sagittal suture by vaginal examination and noting its relative position with reference to the symphysis pubis and the sacral promontory. Where difficulty is experienced in diagnosis the whole hand has to be introduced into the vagina, when the condition above described will be readily recognised.

Prognosis depends upon the degree and variety of the pelvic contraction and is favourable in the moderate degrees of contraction.

Treatment If pelvic contraction is not present manually correct the abnormality, usually there is associated pelvic contraction, and the appropriate treatment is that necessary to deal with the variety and degree of this contraction.

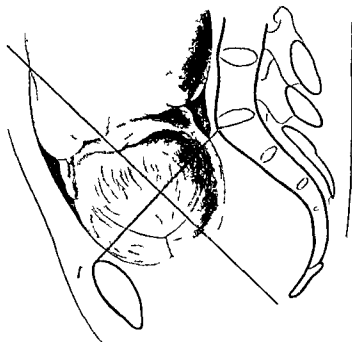


FIG. 93.—Posterior or oblique position (Litzmann's obliquity).

Brow Presentation

When that portion of the vertex between the anterior fontanelle and the glabella forms the presenting part because of partial extension of the head a brow presentation results. In this position the head lies midway between complete flexion and complete extension and as such the brow may be observed as a transitory presentation at the beginning of labour later becoming converted into a vertex presentation by increased flexion or into a face presentation by increased extension thus assuming an attitude of greater stability.

Frequency This is fortunately one of the rarest of cephalic presentations and at the Government Hospital for Women and Children Madras in a series of 20 420 cases of consecutive confinements this presentation occurred in 8 cases or 1 in 2552 cases.

Ætiology All factors which cause deflexion of the head may favour a brow presentation. Thus, the factors concerned in

such deflexion attitudes may be classified under the following headings —

(a) *Faults in the Passages* —

- (1) Contractions of the pelvis
- (2) A pendulous abdomen
- (3) Obliquity of the uterus to the right or left sides
- (4) Tumours of the lower segment of the uterus
- (5) Placenta previa
- (6) A loaded rectum or a distended bladder

(b) *Factors associated with the Passenger or Fœtus* —

- (1) Hydræmnios
- (2) Congenital dolichocephalic head
- (3) Tumours of the neck of the fœtus
- (4) Cord several times round the neck
- (5) Spasm of the muscles of the neck of the fœtus
- (6) Prematurity or death of the fœtus
- (7) An abnormally big or a very small fœtus
- (8) Anencephalic fœtus

(c) *Faults in the Forces* —

Weak uterine contractions at the commencement of labour

Positions Although in a brow presentation it is possible for the fœtus to be in one of six positions as in a vertex clinically only two positions are recognised —

- (1) Where the back is to the right and
- (2) Where the back is to the left

Diagnosis On palpation by the second pelvic grip and Pawlik's grip the head will be found in the lower pole of the uterus and by careful examination it will be noted that the chin and the occiput are on the same level and that the presenting part does not engage in the brim of the pelvis or only attempts to engage late in labour. A vaginal examination will reveal certain signs indicative of abnormal presentation together with other signs diagnostic of a brow presentation.

Signs suggestive of Abnormal Presentation In all cases where the presenting part does not fill the brim of the pelvis and a free communication therefore exists between the forewaters and the afterwaters certain signs pointing to the presence of an abnormal presentation will be made out on vaginal examination. Such signs may be found in brow, face, breech or transverse presentations and in those cases of vertex presentations where the head does not engage in the brim of the pelvis after the onset of labour because of

disproportion a malposition or even an unsatisfactory attitude. These signs are —

- (1) A cone shaped bag of membranes felt when the cervix has dilated sufficiently
- (2) Premature rupture of the membranes
- (3) The cervical os dilating slowly and often never reaching completion.
- (4) The presenting part high up and difficult to reach with the fingers by vaginal examination
- (5) After rupture of the membranes the cervix not taken up and the cervical lip remaining thick and hanging loosely
- (6) Occasionally presentation of the cord or after rupture of the membranes prolapse of the cord may be met with.

Signs indicative of the Particular Abnormal Presentation In a case of brow presentation these signs consist in recognising certain bony landmarks and soft parts

The bony landmarks are the supraorbital ridges the frontal eminence and the glabella. The soft part is the anterior fontanelle which is a lozenge shaped space from which four sutures radiate namely the sagittal the two halves of the coronal and the frontal suture and four bones meet namely the two parietal bones posteriorly and the two frontal bones anteriorly

If therefore it is possible to make out the supraorbital ridges at one end of the presenting part and the anterior fontanelle at the other end the presentation is a brow

Mechanism A brow presentation in the great majority of cases owing to its unstable nature converts itself early in labour into a face or a vertex presentation. If it persists progress will usually be arrested where the pelvis is of normal size and the child at term is normally developed, because the diameter of engagement in a brow presentation is the longest diameter of the foetal head—the vertexo mental—which measures $5\frac{1}{4}$ ins. In cases however where the pelvis is either big or the foetal head is small owing to prematurity moulding may take place and the brow slowly descends into the pelvis rotates towards the symphysis pubis and the maxilla becomes fixed under it. Flexion then takes place and the brow the vault of the skull and occiput are born in succession. The occiput now drops over the perineum and the face and chin appear from underneath the symphysis pubis. After delivery of the head shoulder rotation and restitution occur as in a vertex presentation.

Prognosis The prognosis for both mother and foetus is unfavourable unless assistance is available and proper treatment is adopted. The dangers to the mother are exhaustion from an

obstructed labour, severe laceration of the parturient canal, including rupture of the uterus which may follow tonic contraction if assistance is not available in time shock and sepsis the result of the prolonged labour and necessary interference



FIG 99 —Engagement of the head in a brow presentation

The dangers to the child are excessive moulding and compression of the skull causing intracranial injuries asphyxia due to prolapse of the cord or interference with the placental circulation by



FIG 100 —Moulding and caput in brow presentation

abnormally strong and frequent uterine contractions together with the incidental dangers of the operative measures that may be needed

Management Spontaneous delivery of a brow presentation should never be counted on. It is not justifiable to hope for

spontaneous rectification to occur and it is therefore the duty of the obstetrician to interfere as early as possible once a diagnosis of brow presentation is made

The first thing to determine is the cause of the brow presentation. If it is the result of contracted pelvis or a pelvic tumour attention must be directed to that causative factor and a suitable method of treatment adopted for it. In some of these cases where there is gross disproportion it is desirable to do a Cæsarean section as vaginal modes of delivery are out of question. Should however the brow presentation not be due to any such factors the treatment will depend upon the stage of labour at which the woman comes under observation.

(a) *If the woman is seen early in Labour before the Membranes have ruptured and the Cervix is hardly dilated* The position may be corrected by abdominal manipulation in a manner similar to that to be described under face presentation. A vertex presentation is thus brought about and a tight abdominal binder is applied and the further course of labour left to nature.

(b) *Membranes entire Cervix Two-fifths dilated* Two methods of treatment are available —

(i) Conversion into a vertex by combined internal and external manipulation. Between the pains the sinciput is pushed up by two fingers in the vagina while at the same time a hand on the abdominal wall presses the chest of the child backwards so as to favour the production of an attitude of complete flexion.

(ii) Wherever possible we recommend the conversion of a brow into a breech presentation as the most suitable method of treatment and one which avoids complications at a later stage in labour. When the membranes are entire this can be attempted by external or bipolar podalic version the head being pushed upward while simultaneously the other hand pushes the breech down towards the pelvis. The details of these procedures will be more fully dealt with in the chapter on version.

(c) *If the Membranes have ruptured the Os is nearly fully dilated and the Brow not engaged* Internal podalic version and extraction affords a favourable method of terminating labour.

Attempts at favouring complete flexion by pushing the sinciput up or the occiput down may be tried or as an alternative if the chin is more anterior the occiput may be pushed up and a face presentation brought about. A face presentation although an abnormal presentation has a much more favourable prognosis both for the mother and the child as long as the chin is anterior.

Once the brow has been converted into a face or vertex

presentation labour should be allowed to progress spontaneously, and only when signs of fetal or maternal distress manifest themselves is it necessary to consider interference.

(d) *If the patient is seen late in labour* when the brow has partially descended into the pelvis and the uterus is tonically contracted version is contraindicated as it would precipitate rupture of the uterus. The methods of treatment available are —

- (i) If the chin is posterior conversion into a vertex presentation by pushing the sinciput up or bringing the occiput down with the half hand introduced into the vagina and the patient under deep anaesthesia
- (ii) When the chin is anterior conversion into a face presentation by pushing the occiput up
- (iii) In rare cases forceps may be applied and gentle traction attempted as very occasionally when the head is relatively small it may succeed. Care must be taken however not to use great force
- (iv) If the child is dead craniotomy

We do not advocate symphysiotomy or pubiotomy in such cases as at the late stage at which the patients are seen the risks are great for the mother and the chances of survival of the fetus remote.

In a few cases it is possible to perform a lower segment Caesarean section and deliver a living child. The conditions under which this operation may be performed and the contraindications will be dealt with in the chapter on Caesarean section.

Face Presentation

This is the result of complete extension of the head and occurs in about 1 in 250 cases. In face presentation the chin is the denominator and that part of the cephalic pole which lies between the chin and the frontal eminence tries to engage in the pelvis.

Face presentation may be either primary or secondary. It is primary when it exists before the onset of labour and secondary when it develops only during the course of labour as a result of obstruction to the proper engagement of the head in the brim of the pelvis.

Ætiology Among the factors responsible for the causation of a primary face presentation are —

- (a) Intrinsic factors connected with the fetus such as anencephaly, dolichocephalic head, tumours of the neck and cord several times round the neck.
- (b) Extrinsic factors for example contractions of the pelvis, obliquity of the uterus.

Secondary face presentation is more likely to occur in cases where owing to the difficulty in engagement of the head the cephalic pole is in a state of unstable equilibrium and the sinciput tries to descend in advance of the occiput thereby favouring extension. Among the contributory causes for this condition are —

- (1) Contractions at the brim of the pelvis
- (2) Obliquity of the uterus
- (3) Disproportion between the head and the pelvis owing to the large size of the head
- (4) Tumours in the region of the brim of the pelvis
- (5) Pendulous abdomen

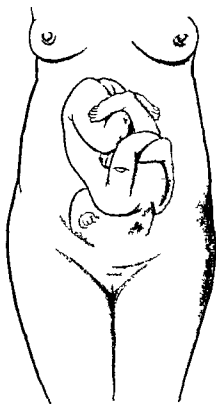


FIG 101 — Face presentation

Positions As in a vertex presentation we can differentiate six positions in a face presentation. The chin being the denominator the positions are —

- | | | | |
|----------------------------|---------|------------------|-------|
| (1) Right mento posterior | (R M P) | corresponding to | L O A |
| (2) Left mento posterior | (L M P) | | R O A |
| (3) Left mento anterior | (L M A) | | R O P |
| (4) Right mento anterior | (R M A) | | L O P |
| (5) Left mento transverse | (L M T) | | L O T |
| (6) Right mento transverse | (R M T) | | R O T |

It will be noticed that the position of the back of the foetus in relation to the maternal pelvis is the same in the corresponding positions of face and vertex and the only difference is complete extension instead of flexion so far as the attitude of the head is concerned. The commonest positions of a face presentation are right mento posterior (R M P) and left mento anterior (L M A).

Diagnosis Occasionally the shape of the uterus may give an important indication as especially when the back is posterior the limbs are pushed prominently to the front against the anterior wall of the uterus and the abdominal wall. By *abdominal palpation* in Pawlik's grip or the second pelvic grip a hard round prominence the occiput is felt separated from the back of the child by a deep groove. If an attempt is made to feel the relative position of the occiput and the chin it will be found that the occiput is always at a higher level than the chin. The hoof like mandible can be recognised as the chin particularly if the back is posterior. When the head has descended the prominence of the occiput to one side and difficulty in palpating the back of the foetus together with the resistance of the chin felt on the opposite side will indicate that the presentation is a face.

Auscultation will reveal the foetal heart to be best heard below the umbilicus. When the back is posterior the foetal heart sounds are heard with great distinctness and with a thin abdominal wall it may occasionally be possible to palpate the heart beats.

Vaginal Examination The signs of abnormal presentation already referred to under brow presentation are found in a face presentation early in labour. When the membranes have ruptured it is possible to make out certain bony landmarks and soft parts. The bony landmarks are —

- (1) The hoof like chin ✓
- (2) The malar eminence on either side of the face
- (3) The supraorbital ridges

The soft parts felt are the nose and the mouth. The mouth is recognised by—

- (a) The alveolar ridges
- (b) The tongue
- (c) Occasionally the suckling movements of the child may be noted

The only other presentation with which a face presentation may be confused is a breech presentation. A careful examination will easily reveal the points of differential diagnosis.

Differential Diagnosis between Face and Breech

FACE	BREECH
Chin malar eminences and supra orbital ridges can be made out as hard bony landmarks	The ischial tuberosities and coccyx and sacrum are made out
The mouth can be recognised by the alveolar ridges the tongue and the sucking movements	Anal canal can be made out by gripping of the finger by the sphincter and by the absence of the alveolar ridges and the tongue
The finger introduced into the mouth may not be soiled	Pure meconium is always present on the examining finger introduced into the rectum
On deep vaginal palpation the ear may be made out	On deep palpation the groove of the groin is made out
	The external genitalia particularly in the male child may be made out

We do not think any real difficulty should be experienced in differentiating a face from a breech except where the presenting part is very high up early in labour and the cervix barely admits two fingers. In such cases if a doubt exists it is better to make a thorough examination under anaesthesia.

Occasionally late in labour excessive caput formation on the face tends to obliterate landmarks but careful examination will prevent any mistake in diagnosis.

Care must be exercised in making internal examinations in face presentations so as to avoid damage to the eyes in particular as well as lacerations of the face. It is also desirable not to insert the finger into the mouth as it may provoke respiratory efforts on the part of the child.

Mechanism The part played by the occiput in a vertex presentation is simulated by the chin in a face presentation. The movements which help to deliver the face are —

- (1) Descent with increased extension
- (2) Internal rotation of the chin
- (3) Flexion
- (4) Restitution
- (5) External rotation

At the beginning of labour the head is fairly high and may not always be in an attitude of complete extension. When labour starts and descent begins an exaggeration of extension takes place. The chin becomes the most dependent part and the face engages by its cervico-bregmatic diameter in one or other of the oblique diameters of the pelvis. As the head descends the chin meets the pelvic floor first and anterior rotation of the chin occurs so as to bring it well underneath the symphysis pubis. After it becomes



FIG. 102.—Delivery of the face in a face presentation

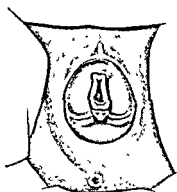


FIG. 103.—Mechanism of delivery in a face presentation

fixed there flexion occurs. As a result of this, the mouth, nose, forehead and sinciput escape sweeping over the perineum. As soon as the head is delivered restitution takes place, as in a vertex presentation, and external rotation of the head corresponding to the movement of internal rotation of the shoulders. The rest of the body is delivered thereafter.

In cases where the chin is anterior at the time of the onset of labour, internal rotation takes place through one eighth of a circle, where the chin is posterior, as in right mento posterior and left mento posterior positions, the chin rotates through the larger arc of the circle, that is, through three-eighths of a circle (135°).



FIG 104 —Impacted mento posterior

Abnormal mechanisms may occur in the rotation. The chin may not rotate at all, or be arrested at any stage in the movement of internal rotation, or again the chin may rotate into the hollow of the sacrum. Accordingly, in a case of face presentation where the chin is posterior, the chin may be felt at one of four positions —

- (1) In the hollow of the sacrum directly posterior
- (2) Opposite a sacro iliac synchondrosis
- (3) At one end of the transverse diameter of the pelvis
- (4) Opposite the acetabulum, that is, 45° from the symphysis pubis

When the chin remains posterior, further efforts at delivery only impact the face more tightly, as with each attempt to push the head down a portion of the neck and body of the fœtus is also pushed down simultaneously, so that the diameter of the engaging part becomes increased by the thickness of the chest of the fœtus.

The difference between a persistent mento posterior and a persistent occipito posterior is therefore obvious, that whereas natural efforts by forcible uterine contractions may succeed in a case of persistent occipito posterior, in a case of persistent mento posterior they will never succeed in effecting delivery

A favourable termination is not therefore possible, and if no help is available the fetus dies from asphyxia and the mother from rupture of uterus or exhaustion

Clinical Features Most cases of face presentation with the chin anterior are delivered by natural efforts, as in these cases the diameter of engagement, the submento bregmatic, is equivalent in length to the suboccipito bregmatic, which engages in a vertex presentation. If, therefore, there be no disproportion between the head and the pelvis due either to contraction of pelvis or to the increased size of the head, a face presentation if the position is anterior is generally delivered spontaneously. The possibilities of premature rupture of the membranes and prolapse of the cord should however, be borne in mind

When the chin is posterior, however reverse rotation of the chin may take place, and then further progress is impossible

As with abnormal presentations, in general, premature rupture of membranes may lead to imperfect dilatation of the cervix, draining of the liquor amni, with the accompanying dangers of a dry labour and prolongation of the first and second stages

✓ **Prognosis — Mother** The risks to the mother are increased owing to the following factors —

- (1) Prolongation of the stages of labour due to the factors concerned in the causation of the face presentation and possibly premature rupture of the membranes
- (2) The more frequent vaginal examinations necessary to ascertain the progress of labour
- (3) The greater necessity for instrumental or manipulative interference
- (4) The dangers incidental to persistent mento posterior positions

Child Here the prognosis is definitely worse. The fetal mortality in face presentations varies between 10 and 15 per cent, as compared with a mortality of 2 to 3 per cent in vertex presentations. The causes of these increased risks are —

- (1) Prolapse of the cord.
- (2) Prolonged uterine pressure after premature rupture of the membranes
- (3) Faulty mechanism in delivery, such as unrotated mento posterior positions
- (4) The operative interference necessitated

- (5) Vaginal examinations may cause damage to the face and if sufficient care is not taken the eyes may be seriously injured
- (6) Frequently owing to the caput that is formed about the mouth and face and possibly also because of a certain amount of œdema of the larynx and trachea the child is unable to cry lustily and often has a hoarse voice for two to three days after delivery and for the same reason is not able to suck at the breast during that period



FIG 105.—Caput in face presentation



FIG 106.—Caput and moulding in face presentation

Management The treatment of this condition depends upon the stage of labour at which the malpresentation is discovered. The case may be met with —

- (a) In the last weeks of pregnancy
- (b) Early in labour before rupture of the membranes with the presenting part not engaged
- (c) Before rupture of the membranes, after engagement of the presenting part
- (d) After rupture of the membranes

We shall now consider in detail the methods of treatment available at each of these stages —

(a) *Woman seen in the Last Weeks of Pregnancy with a Face Presentation*

In such cases ascertain the position of the face presentation and in particular determine if the pelvis is contracted and if so the nature and degree of contraction

If the pelvis is contracted the proper method of treatment depends upon the type and degree of contraction. In all cases of abnormal presentation we recommend that this factor should be borne in mind and a careful investigation made to recognise contractions of the pelvis. The malpresentation in such cases is a secondary factor and should help us to focus our attention on the nature of treatment required for the primary factor namely the contracted pelvis.

Where there is no contraction of the pelvis the question to be decided is whether any interference is called for. We hold that if the chin is anterior in a face presentation none is required. For



FIG. 107.—Conversion of a face into vertex by combined manoeuvres.

the reasons already stated the clinical course of labour in a mento anterior position does not differ materially from that of an occipito anterior position.

If the chin is posterior it may be possible to change the presentation into a vertex by external abdominal manipulation according to the method described by Schatz. The advantage of converting it into a vertex presentation is obvious because a mento posterior position when converted into a vertex becomes an occipito anterior position, in other words the most unfavourable position in a face presentation is converted into the most favourable position in a vertex.

Schatz's manoeuvre or the method of converting a face into a vertex presentation consists of three manipulations.

- (1) Raise the presenting part above the brim of the pelvis so that it is freely movable
- (2) By abdominal manipulation press the chest of the fetus towards the back with the palm of one hand, while the other hand is used to push the breech in the opposite direction
- (3) By fundal pressure push the breech down in the direction of the occiput

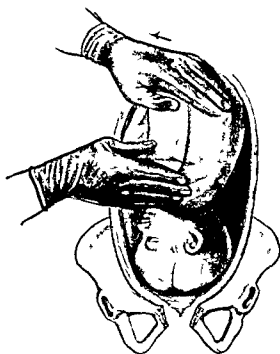


FIG 103—Schatz's manoeuvre

This will promote flexion of the head and result in the conversion of the face into a vertex presentation. After conversion a tight abdominal binder may be applied for some time.

Schatz's manoeuvre is often not successful, due to thickness of the abdominal wall of the mother or the want of laxity of the uterus. Besides, it must be remembered that incomplete reduction results in a brow presentation. For these reasons we have not adopted this method as a routine in the treatment of mento-posterior cases and prefer to leave the woman alone, advising her to report to us as soon as labour starts, and also not move about if she should have signs of labour pains coming on.

(b) *Early in Labour, before Rupture of the Membranes and when the Presenting Part has not engaged*

Here, three courses are open to us —

- (1) To leave the case to progress without any interference—a method which we would certainly adopt where the chin is anterior. The woman must however be told not to walk about in the first stage of labour and every effort should be made to prevent early rupture of the membranes.
- (2) To try and convert the face into a vertex presentation by the external manipulative measures already described as Schatz's manoeuvre.
- (3) To convert the face into a breech presentation. The conversion of the face into a breech presentation is useful in mento posterior cases associated with minor degrees of contracted pelvis of the flat variety. We have already stated that where the chin is anterior we do not think any advantage is gained by interference unless a definite indication arises late in labour owing to signs of foetal distress.

(c) Before Rupture of the Membranes and after Engagement of the Presenting Part

In such cases it is well to allow plenty of time for labour to progress so that the chin may rotate anteriorly. As in occipito posterior presentations we favour the patient lying on the side to which the chin is pointing with a view to help forward rotation. The descent of the chin takes time and till it has reached the pelvic floor it cannot rotate forwards and hence early rotation cannot be expected in cases of mento posterior positions.

In some cases when the cervix is about three fifths dilated and the chin is posterior it may be possible under an anæsthetic gently to dislodge the presenting part and perform internal podalic version and bring down a foot and leave the rest of the delivery to take place spontaneously.

(d) After Rupture of the Membranes

Besides the partial escape of liquor amnii one of four possibilities may result —

- (1) The face may descend the chin rotate anteriorly and the child be born spontaneously.
- (2) The face may be arrested at the brim and no further progress takes place.
- (3) The face may descend and be arrested in the cavity of the pelvis at various stages in the movement of forward rotation.
- (4) The face may descend and the chin rotate posteriorly and so become a persistent mento posterior case.

1 *Spontaneous Delivery* This is to be expected in uncomplicated cases of face presentation where the mentum is anterior. In the presence of good uterine contractions the natural tendency is for the face to engage and pass through the pelvic cavity with the movement of internal rotation which brings the chin anteriorly. In some cases of mento posterior position also the chin may rotate forward and be born by natural effort. It is therefore worth while in such cases to watch carefully and note the advance of the face and more particularly the advance of the chin anteriorly in the movement of internal rotation.

2 *The Face arrested at the Brim* The possibilities of disproportion should always be borne in mind in such cases. Where such disproportion exists the treatment will depend as has been indicated above on the degree of disproportion and the nature and degree of contracted pelvis. Where however the pelvis is not contracted or only moderately so particularly in the anteroposterior diameter internal podalic version offers a method of delivery which will save the child without any risk to the mother. The advantage of version over other methods of treatment in such cases lies in the fact that after a successful podalic version the risks to the mother are negligible and with a moderate amount of experience the risks to the child are less than by any other

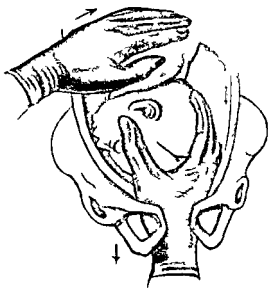


FIG. 109—External rotation method of correcting fetal vertex

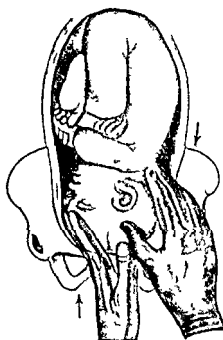


FIG. 110—Conversion of fetal vertex by internal manipulation (Bastard's method)

Theoretically these methods appear to be excellent and would appear to afford a very satisfactory means of converting an unfavourable presentation particularly a mento posterior into the most favourable of vertex presentations namely, an occipito anterior. In practice, however, they are not easy to accomplish, and occasionally a brow presentation may result by the failure to secure complete flexion by either of the two manipulations. It is for these reasons that we prefer, wherever possible to convert a face when the chin is posterior into a breech presentation.

In some cases the question of Cæsarean section may have to be considered when the child is alive and in such cases the precautions and contraindications that will be stressed later in connection with Cæsarean section will have to be borne in mind.

3 *The Face arrested in the Pelvic Cavity* A not infrequent cause of arrest of the face in the cavity is weak uterine contractions. In such cases particularly if the chin has entered the anterior quadrant of the pelvis the uterus can be stimulated to contract by small doses of pituitary extract $\frac{1}{6}$ to $\frac{1}{4}$ c.c. In all probability this will help to complete internal rotation and effect delivery of the fœtus. If it does not succeed forceps may be applied and the child delivered provided the cervix is fully dilated.

Where however, the cause of delay is an imperfectly rotated mento posterior position the case requires more energetic treatment. In all such cases interference should be delayed as much as possible, in the hope that spontaneous internal rotation of the chin will occur which both from the point of view of the mother and the child offers a much better prognosis than will accrue from undue haste in interference. For these reasons the fœtal heart must be watched carefully the mother's condition noted and the state of the uterus followed. Where however signs of fœtal distress manifest themselves or are likely internal rotation may be assisted by the introduction of the half hand into the vagina to grasp the chin and manually rotate it forward. This is known as Madam La Chapel's manoeuvre and does succeed in many cases if the face is not actually jammed in the pelvis.

If the chin does not rotate in spite of these manipulations we believe that forceps can be applied traction made and anterior rotation favoured by slightly rotating the forceps. Considerable difference of opinion exists as to whether the forceps should be used as a rotator in cases of mento posterior positions. We are fully aware of the dangers and the risks incidental to such rotation particularly for the fœtus, but we believe that where the chin is lying in the transverse diameter of the pelvis and especially if it is not tightly jammed careful rotation of the forceps to a slight extent to carry the chin anteriorly beyond the transverse diameter of the pelvis will help considerably in the course of the

further delivery. It is a mistake to rotate the chin completely anteriorly and to bring it underneath the symphysis pubis by the forceps alone. What should be attempted when the forceps is used as a rotator is to dislodge the chin from the place where it is fixed and to rotate it probably through 45° so as to bring it anywhere within 45° of the symphysis pubis.

The forceps may sometimes be applied immediately after rotation of the chin by the half hand which keeps it in the position to which it has been rotated while the blades are slipped into position by the other hand.

If all attempts at forward rotation of the chin fail and the chin is posterior or reverse rotation of the chin has already taken place no useful purpose will be served by trying to drag the head through the pelvis. The chances of delivering a live child or one that is capable of surviving are remote and in such cases craniotomy is justifiable. In performing craniotomy in a mento posterior position the forceps should be applied and the perforator passed either through the mouth or through the orbit into the cranium. After destroying the brain traction by the forceps helps to reduce the size of the fetal skull and gradually to deliver it.

We have not discussed the place of symphysiotomy or pubiotomy in the treatment of mento posterior complications because we feel that such a procedure is inadvisable as it is attended with grave risks to the mother and with doubtful chances of delivering a live child.

To sum up face presentations may be left to nature so long as the chin is anterior and in the absence of any complications.

Where the chin is posterior efforts should be made to rotate the chin anteriorly and so favour spontaneous delivery or help with the application of forceps.

If there is any difficulty or doubt and conditions are favourable podalic version is undoubtedly a safer method of procedure in the interests of the mother and very often in the interests of the child as well.

Where internal rotation of the chin is not possible occasionally the forceps may be used as a tractor and also as a gentle and partial rotator the rest of the rotation being favoured either by the use of the hand or just left to nature.

Where however the chin is persistently posterior and rotation fails or reverse rotation of the chin has occurred and the face is jammed in the pelvis it is wiser to perform craniotomy and deliver the foetus.

Cæsarean section must be the method of choice in certain select cases but symphysiotomy and pubiotomy are not to be advocated in cases of mento posterior position.

Glabellar Presentation

In some cases hitherto classified as face presentations it has been noticed that the head lies in a position of partial extension midway between a brow and a face. These cases are not infrequently mistaken for a face presentation for if a vaginal examination be made the finger would reach the chin and the mouth and orbital ridges can be felt. A closer examination how



FIG. 111.—Glabellar presentation.
a showing the caput. *b* showing the caput and moulding.

ever will make it clear that the chin is not easily within reach and if the examination be confined to the actual part presenting the supra-orbital ridges the glabella the malar eminences and the superior maxillary bone will be palpated. To such a presentation the term glabellar presentation has been given because the glabella is the mid point of the presenting area. The diameter of engagement in such cases is the mid supramaxillary vertical diameter which is the distance between the mid point of the alveolar ridge of the superior maxilla and a point midway between

the two fontanelles. By actual measurement of a large number of cases it has been found that this diameter varies between 4 and 4½ ins.

The striking point about this presentation is that there is no caput formation on the chin and the lower lip nor is there any trace of it over the anterior fontanelle. The caput forms mostly on the supra orbital ridges, the glabella, the nasal eminences, the eyelids and the upper lip.

The mechanism of delivery is almost similar to that of a face presentation except that instead of the chin the upper jaw is the denominator. In cases where the upper jaw rotates to the front delivery may be spontaneous. Occasionally help with forceps may be necessitated. In some cases however there may be considerable delay and the presenting part may not descend. In such cases the method of treatment to be adopted is to convert it into a full face presentation and aid anterior rotation of the chin or if the head is still high up to perform internal podalic version and deliver the child provided the conditions are favourable for such an operation. Where however, a glabellar presentation has become jammed in the pelvis and the fetal heart is not audible perforation through the mouth is necessary before effecting delivery.

The prognosis is a little more unfavourable so far as the child is concerned than in a face presentation. It need not be worse for the mother if suitable precautions are taken.

CHAPTER XXVIII

PELVIC PRESENTATIONS

HITHERTO we have been dealing with cephalic presentations. we shall now consider podalic or pelvic presentations where the podalic pole of the fetus is found at the brim of the pelvis.

Varieties. There are two varieties of breech presentation —

(a) Complete (b) Incomplete

Complete breech is one where the fetus maintains the attitude of universal flexion as in a normal vertex but with this difference that the lower or pelvic pole of the fetus presents at the brim of the pelvis.

In cases of *incomplete breech* on the other hand the attitude of universal flexion is disturbed and varying degrees of extension occur at the podalic pole. Thus one may meet with cases of —

(a) *Frank breech or extended breech* where both the thighs are flexed but the legs are extended so that the lower limbs lie along the ventral surface of the child's trunk.

- (b) *Knee presentation* where the thigh is extended but the leg is flexed
- (c) *Footling presentation*, where the thigh is extended at the hip and the leg is extended at the knee

In knee and footling presentations both the extremities may be involved or only one of them

Frequency The frequency of breech presentations is variously estimated, but it may be said that they generally occur once in about fifty cases. At the Government Hospital for Women and Children, Madras, there occurred 492 cases of breech out of a total number of 20,420 consecutive confinements, giving a proportion of 1 in 42 deliveries

Ætiology Anything which interferes with the normal shape of the foetal ovoid or changes the shape of the uterine ovoid may result in a malpresentation, such as a breech presentation. The factors favouring a breech presentation are —

- (1) *Faults in the Passages and Forces* Obliquity of the uterus, relaxation of the uterine and abdominal walls, abnormal mobility of the uterus, particularly in women who have borne many children, uterine fibroids, placenta prævia, ovarian tumours, contractions of the bony pelvis
- (2) *Faults in the Passenger (Fœtus)* Hydramnios, prematurity, multiple pregnancy, monstrosities, foetal anomalies such as hydrocephalus, hydrothorax, ascites, distended bladder, dead and macerated foetus

We frequently see the co-existence of several of these factors in a given case

Positions Four positions are described. The sacrum is used as the denominator in breech presentation and depending on the position of the sacrum a breech may present as —

- (1) Left sacro anterior (L S A), which is the commonest
- (2) Right sacro anterior (R S A)
- (3) Right sacro posterior (R S P)
- (4) Left sacro posterior (L S P)

It will be seen that these positions correspond with the relative positions in a vertex presentation, except that instead of the occiput the sacrum is below at the brim of the pelvis

Mechanism of Labour The breech enters the brim of the pelvis with the bis iliac diameter in one or other of the oblique diameters. In the left anterior position it is the left oblique diameter, in the right anterior position it is the right oblique diameter

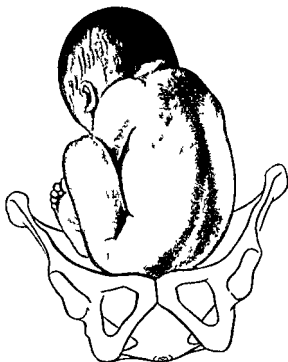


FIG 112 —Breech presentat on LSA

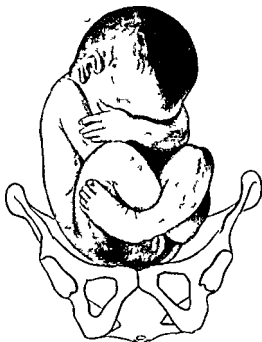


FIG 113 —Breech presentat on RSP

Before labour commences the breech does not enter the brim of the pelvis as the cephalic pole would so that the presenting part is felt higher up and not engaged. When however labour starts the first movement is descent with compaction. *Compaction* means that every part of the body becomes a little bit more flexed the same movement in reality that takes place in a vertex presentation where the increased flexion permits a smaller diameter to engage in the brim of the pelvis. Thus descent with compaction drives the breech down through the pelvis till the anterior buttock

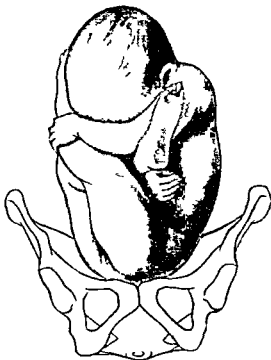


FIG. 114.—Breech presentation with one leg extended

reaches the floor of the pelvis when the second movement takes place namely *internal rotation*. It always results in the anterior buttock moving towards the symphysis pubis through one-eighth of a circle whether the sacrum is in the anterior or posterior position there is always one buttock anteriorly which can move through one-eighth of a circle and thus bring the buttock to the symphysis pubis. After internal rotation has taken place the next movement is *latero flexion*. This movement is in reality the counterpart of the movement of extension in a vertex and flexion in a face presentation. The need for latero flexion will be realised when it is stated that it is only by this movement that the breech is able to pass through the cavity and present at

the outlet The breech then distends the perineum and is born. Once the breech has been delivered outside the vagina the body slips out, the shoulders now engage in the same oblique diameter as the buttocks engaged in, and by the movement of internal rotation the anterior shoulder hitches against the symphysis pubis the posterior shoulder sweeps over the perineum and is born first the anterior shoulder following later. After descent of the shoulders the head engages in the opposite oblique diameter if the breech had passed through the left oblique diameter the head would engage itself in the right oblique diameter. Rotation takes place

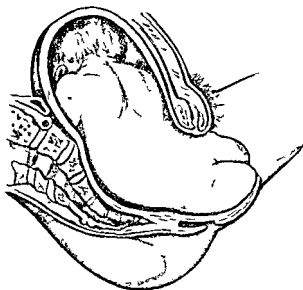


FIG. 115.—Mechanism of delivery in a breech. Latero flexion

bringing the occiput underneath the symphysis pubis, and then by a movement of flexion the head is born.

The mechanism of a breech presentation therefore is a little more complicated than the mechanism of a vertex or a face presentation. The head like the breech has to go through a mechanism before it can be born namely, internal rotation with increased flexion. In fact the mechanism in breech delivery consists of three stages—delivery of the breech, delivery of the shoulders and delivery of the head. Occasionally, when the back is posterior, the movement of internal rotation of the breech carries the body sometimes to the opposite oblique diameter, in other words, when the back is posterior the anterior buttock rotates not merely through one eighth of a circle but through one fourth of a circle to the opposite side, and the back which was posterior becomes anterior, so that the further stages of delivery present no difficulty.

Sometimes the after coming head in a posterior position fails to rotate with the trunk anteriorly and so adopts a persistent occipito posterior position. If the head is small and spontaneous delivery is possible the face slips down behind the symphysis pubis and the chin is born first but usually labour is held up.

Diagnosis — Abdominal Palpation On palpation unless the patient is unduly fatty or the muscles held rigid or the uterus is contracting strongly the cephalic pole will be felt at the fundus of the uterus and can be differentiated from the breech in that position by the fact that the head is smaller, is harder, is more movable and ballottes independently of the rest of the body, and in some cases the occiput and the chin can be distinctly felt. Umbilical grip will reveal the presence of the back on one side and the limbs on the other. By means of the pelvic grips the large breech is felt at the lower pole and it can be recognised as such as it moves with the rest of the body and is softer than the head.

Auscultation is also of considerable help. The foetal heart will be heard above the level of the umbilicus either to its right or left depending upon the position of the back. It will be heard nearer the middle line when the back is anterior and farther out when the back is posterior.

Vaginal Examination Early in labour vaginal examination will reveal all the signs suggestive of an abnormal presentation already referred to namely the cone shaped bag of membranes imperfect dilatation of the os the presenting part fairly high up and if the membranes have ruptured prematurely as they often do the cervical edges hanging loose and fringe like.

Later in labour a breech is made out on vaginal examination by the recognition of certain bony landmarks and soft parts. The ischial tuberosities on either side and the sacrum behind may be felt. The finger may feel the external genitalia and occasionally the sex of the foetus may be ascertained. The anal aperture may also be made out on the introduction of the finger when it will be noted that the sphincter grips the finger which is stained by pure meconium. Sometimes the feet may be made out or the knees. If the finger is passed fairly high up the groove of the groin may also be felt. In cases of difficulty or doubt when a breech is high up it is well to give the patient an anæsthetic and introduce the whole hand into the vagina to make out the exact nature of the presentation.

The breech may sometimes be mistaken for a face presentation the knee for an elbow and the foot for a hand. The points of distinction are as follows —

(1)

BREECH

The ischial tuberosities and the sacrum can be made out

The aperture through which the finger is passed is recognised to be the anus because of the grip of the *sphincter pure meconium staining* the finger and the absence of alveolar ridges and the tongue

The external genitalia can be recognised particularly in the male
The groove of the groin is reached on passing the finger high up

FACE

The hoof-like chin and malar eminences and the supra-orbital ridges are to be particularly noted
The aperture is made out as the mouth because of the sucking movements the presence of alveolar ridges and the tongue

No suggestion of external genitalia in face presentation
The ear can be palpated on passing the finger high up

(2)

KNEE

Broader surface

The patella can be made out
Two tuberosities with a depression between

ELBOW

Narrower surface

No suggestion of any patella
Two condyles with the sharp olecranon between

(3)

FOOT

The toes are more or less on the same level
The great toe is in the same plane as the other toes
Prominence of the heel felt distinctly
The foot is at right angles to the leg

HAND

The fingers are at varying levels
The thumb can be opposed to the other fingers
No prominence to be felt
The hand can be placed in the same plane as the forearm

In cases of extended breech the diagnosis is made from the fact —

- (1) That the ischial tuberosities the sacrum and the external genitalia can be made out
- (2) That the thighs are flexed on the abdomen
- (3) That neither a knee nor a foot can be made out on vaginal examination
- (4) That the breech is almost filling the pelvic brim or cavity

Prognosis —Mother The maternal mortality and morbidity are slightly higher than in vertex presentations for the following reasons —

- (1) The very occurrence of a breech presentation suggests the possibility of some causal abnormality

- (2) Labour is prolonged internal examinations are more frequent and the chances of infection are thereby increased
- (3) Premature rupture of the membranes and failure of the cervix to be completely dilated by the breech increase the risk of laceration of the cervix in the course of delivery
- (4) The necessity for rapid delivery of the head causes a sudden dilatation of the vagina and the perineum which results in a greater degree of trauma to these parts
- (5) The frequency with which assistance is needed to complete the delivery and in particular to extract the head at a stage when uterine contractions have no further effect on the progress of the head
- (6) The possibilities of complications such as extended breech which interferes with the usual mechanism of breech presentation

Child The relatively higher foetal mortality is one of the chief factors responsible for the uneasiness and even dread with which obstetricians approach cases of breech presentation. In uncomplicated cases provided the correct technique is adopted we do not think that breech presentations should be associated with a greater foetal mortality than vertex presentations.

The causes of increased foetal mortality and morbidity in breech presentations are —

- (1) *Asphyxia* This is the commonest cause and may be brought about in various ways —
 - (a) Early rupture of the membranes with escape of liquor amni results in a dry labour, which favours the occurrence of asphyxia
 - (b) Pressure of the after coming head on the cord and the greater amount of time that may be taken in the delivery of the head may produce it
 - (c) The impact of cold air on the body as it is being delivered may cause premature attempts at respiration while the head is still in the pelvis and result in the sucking in of liquor amni and mucus
 - (d) Prolapse of the cord and compression of the cord may lead to asphyxia
 - (e) The escape of the breech through a partially dilated cervix which grips the neck of the child and prevents the delivery of the after coming head may cause a serious degree of asphyxia

(2) *Injuries to the Child* During the course of delivery several injuries may be inflicted on the child some of which may prove fatal These are —

- (a) During delivery of the breech Fracture of the femur laceration of the soft parts of the thigh or the abdominal wall, injury to the femoral vessels and sometimes perforation of the abdominal wall
- (b) During delivery of the shoulders Fracture of the humerus or clavicle, injury to the brachial plexus with resulting paralysis
- (c) During delivery of the after coming head Dislocation or fracture of the lower jaw injury to the floor of the mouth injury to the sternomastoid muscle with bruising and the formation of a hematoma injury to spine and spinal cord intracranial injuries or fracture of the cranial bones The most frequent cause of fatal death is intracranial injury particularly tears of the falx cerebri and of the tentorium cerebelli Such intracranial injuries are much more frequent with premature children

(3) *Premature Separation of the Placenta* Occasionally this complication results from fundal pressure or from uterine contractions subsequent to the passage of the head into the lower uterine segment, but before the child is fully delivered

This formidable list of adverse factors to be considered in estimating both the maternal and fetal prognoses will naturally give the impression that a breech presentation is undoubtedly a grave one to deal with Many of these adverse factors can however, be avoided by suitable care and properly applied manipulative methods

Management — Before Labour When a case has been diagnosed as a breech presentation every endeavour should be made to ascertain the cause since the line of treatment to be adopted depends largely on this If due to a contracted pelvis the variety and degree of contraction should be ascertained In minor degrees of flat pelvis a breech presentation may not be unfavourable and in such cases delivery as a breech may be undertaken at term In other varieties of contracted pelvis other lines of management will have to be adopted depending upon the type of contraction

Where no contraction of the pelvis exists should a breech presentation be allowed to continue as such?

The prevalent view is that it is always desirable to try and convert a breech into a vertex presentation, as it is said to offer a better prognosis for both the mother and the child The question however, has to be considered with reference to the parity of the

as possible so as to allow the cervix to dilate fully. When the membranes rupture a vaginal examination should be made with care to ascertain whether the cord is prolapsed and incidentally to note the dilatation and whether it is a case of extended breech.

Second Stage Once the cervix is fully dilated the rule to be observed in the delivery of an uncomplicated breech is to leave it as far as possible to nature. Fundal pressure can be used during uterine contractions to help the delivery while traction from below is employed as little as possible or better not at all. The obstetrician's duty should be one of watchful expectancy and nowhere is there greater need than here to desist from the habit of meddlesome interference. The temptation to pull upon some prolapsed part of the foetus such as a lower limb is very great but it will lead to a string of complications at every stage in the delivery of the child.

Another point of importance to remember is that it is a fatal mistake to try and deliver a breech through an imperfectly dilated cervix for although the soft trunk may easily be compressed and pass through the delivery of the after coming head will be attended with great amount of difficulty and the neck will be gripped by the partially dilated cervix.

An important point to remember in the delivery of all breech presentations is that no matter with what ease the child may be born it is occasionally asphyxiated and accordingly everything should be kept ready to treat the condition of asphyxia neonatorum.

Preparations for the actual delivery of the breech are made when after rupture of the membranes following full dilatation of the os the breech begins to distend the perineum. The dorsal position for the mother is the better. Occasionally the feet may be caught at the outlet in which case they are gently released by the fingers. As soon as the breech is delivered and the body born up to the umbilicus it should be covered by a warm towel to prevent the impact of cold air which might stimulate premature attempts at respiration. From this point onwards the delivery of the breech should be aided only by fundal pressure. The operator supports the breech and when the child is born up to the umbilicus a loop of the cord is brought down and placed to one side so that it lies in the lacuna in front of the ala of the sacrum. This is done for three reasons —

- (1) To prevent the cord from being compressed in the subsequent course of delivery
- (2) To prevent the cord from being caught at the brim and being snapped
- (3) To feel the pulsations of the cord and so watch the condition of the foetus from time to time

mother In a primipara it is certainly of advantage to convert a breech presentation into a vertex as in the delivery of a breech presentation the dilatation of the vagina and perineum is not so easy and the difficulties of delivery are increased In a multipara with a normal pelvis and with a history of uncomplicated previous deliveries of living children at term we are not convinced that it is necessary in every case to convert the breech into a vertex We have frequently noticed that the breech tends to correct itself into a vertex presentation in the last weeks of pregnancy and this is safer than injudicious attempts at external manipulations It is advisable therefore to wait till the thirty sixth week of pregnancy before considering external version After this date the increasing size of the child makes the manipulation more difficult The risks incidental to the conversion of a case of extended breech should also be borne in mind and in some cases vigorous attempts at external version have been followed by separation of the placenta and even laceration of the uterine wall The cord of the foetus also may become twisted round the trunk or the limbs and thus the child may be asphyxiated Occasionally the version may only partially succeed and a less favourable lie or presentation thus result—an oblique or transverse lie We have mentioned these facts to show that the general impression that an external version is easy and will as a matter of course succeed in converting a breech into a vertex presentation is not borne out by actual experience and that there are certain dangers and difficulties associated with this manipulation In particular external version should as far as possible be done without an anæsthetic as this helps in judging the amount of force that is used At the same time, it should not be thought that external version is not of any value or that it has no place in the management of breech presentations before labour or even early in labour We prefer to leave a breech presentation as a breech and manage it as such particularly in the following cases —

- (1) Minor degrees of flat pelvis
- (2) Cases of placenta prævia
- (3) Hydrocephalus
- (4) In multiparæ with a normal pelvis and history of previous natural deliveries of living children at term

During Labour We shall now consider the management of a breech presentation in an uncomplicated case that is one where there are no abnormalities such as contracted pelvis and the presentation is merely a matter of accident

First Stage The patient does not walk about but lies down throughout the first stage and avoids all bearing down efforts It is important that the membranes should remain intact as long

as possible so as to allow the cervix to dilate fully. When the membranes rupture a vaginal examination should be made with care to ascertain whether the cord is prolapsed and incidentally to note the dilatation and whether it is a case of extended breech.

Second Stage Once the cervix is fully dilated the rule to be observed in the delivery of an uncomplicated breech is to leave it as far as possible to nature. Fundal pressure can be used during uterine contractions to help the delivery while traction from below is employed as little as possible or better not at all. The obstetrician's duty should be one of watchful expectancy and nowhere is there greater need than here to desist from the habit of meddlesome interference. The temptation to pull upon some prolapsed part of the fœtus such as a lower limb is very great but it will lead to a string of complications at every stage in the delivery of the child.

Another point of importance to remember is that it is a fatal mistake to try and deliver a breech through an imperfectly dilated cervix for although the soft trunk may easily be compressed and pass through the delivery of the after coming head will be attended with great amount of difficulty and the neck will be gripped by the partially dilated cervix.

An important point to remember in the delivery of all breech presentations is that no matter with what ease the child may be born it is occasionally asphyxiated and accordingly everything should be kept ready to treat the condition of asphyxia neonatorum.

Preparations for the actual delivery of the breech are made when after rupture of the membranes following full dilatation of the os the breech begins to distend the perineum. The dorsal position for the mother is the better. Occasionally the feet may be caught at the outlet in which case they are gently released by the fingers. As soon as the breech is delivered and the body born up to the umbilicus it should be covered by a warm towel to prevent the impact of cold air which might stimulate premature attempts at respiration. From this point onwards the delivery of the breech should be aided only by fundal pressure. The operator supports the breech and when the child is born up to the umbilicus a loop of the cord is brought down and placed to one side so that it lies in the lacuna in front of the ala of the sacrum. This is done for three reasons —

- (1) To prevent the cord from being compressed in the subsequent course of delivery
- (2) To prevent the cord from being caught at the brim and being snapped
- (3) To feel the pulsations of the cord and so watch the condition of the fœtus from time to time

The next pain will probably drive the shoulders with the arms in a flexed position by the side of the body through the vaginal outlet. After the shoulders are born the head generally slips out.

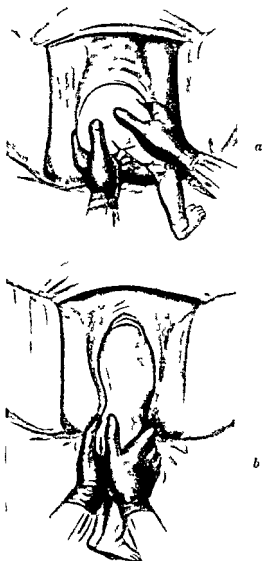


FIG. 116.—Method of delivery of the breech.
Note the method of holding the breech in traction.

with the next pain. If however, it is not delivered it may be because it is lying in the lower uterine segment so that uterine contractions cannot expel it. It may therefore be necessary to assist the delivery of the head. First try fundal pressure, which

in the majority of cases will be found sufficient to help the head out. If this does not succeed one of the several manipulative methods for delivery of the after coming head should be adopted (*vide infra*) along with efficient fundal pressure given by an assistant. We hold that fundal pressure is of the utmost importance because it is by this means that the head is maintained in an attitude of flexion with the suboccipito bregmatic diameter as the diameter of engagement.

As soon as the child is delivered care should be taken to see that it is breathing otherwise the cord should be clamped and cut and the child treated for asphyxia neonatorum.

Complications The course of events may not be as smooth as described above. Various difficulties may arise in the course of delivery of a breech presentation and such difficulties may be due to several factors. The chief of these are —

- (1) Premature rupture of membranes with imperfect dilatation of the cervix
- (2) Prolapse of the cord
- (3) Extended breech
- (4) Impacted breech
- (5) Extended arms
- (6) Nuchal position of the arms
- (7) Difficulties in the delivery of the after coming head

These complications are dealt with *seriatim*.

1 *Premature Rupture of Membranes* It has already been emphasised that complete dilatation of the cervical canal is one of the most important conditions necessary for the successful delivery of a breech. Attempts at delivery through an imperfectly dilated cervix spells disaster. The dangers are twofold. So far as the mother is concerned it means the risk of serious lacerations which may even extend into the lower uterine segment and involve the uterine vessels or open into the peritoneal cavity. Occasionally the soft breech may come through a partially dilated cervix especially if the child is premature while the neck of the fetus is gripped by the cervix and difficulty is experienced in the delivery of the after coming head and if force is resorted to severe lacerations result. For these reasons therefore it is desirable to prevent early rupture of the membranes. The patient should be in bed in the first stage of labour.

Should the membranes however rupture prematurely time must be given for the cervix to dilate fully. A chloral and bromide draught or any mild hypnotic is of service at this juncture as it relieves the woman of tiring ineffective pains and allows her much needed rest. In the majority of cases the cervix will with the aid of efficient uterine contractions dilate in course of time.

Should, however, any necessity arise for immediate delivery in the interests of the child or the mother complete dilatation of the cervix should be effected before the delivery is attempted. Dilatation of the cervix may be aided by one of the following methods —

- (a) *A hydrostatic dilator* such as Champetier de Ribes bag is applied through the cervical canal beyond the internal os and left in position for some hours. The conditions where it can be used the method of application and its dangers are described in the chapter on placenta prævia.
- (b) *Manual Dilatation of the Cervix* This is the method adopted in the large majority of cases where the cervix is fairly soft and easily dilatable. The gloved hand is introduced with the usual antiseptic precautions inside the vagina and the cervical canal is gradually stretched by separating the fingers till the canal is fully dilated.
- (c) *Multiple Incisions of the Cervix* This method is adopted when rapid delivery is indicated in the interests of the fœtus and when the cervical canal is effaced but the external os is only partially dilated. The details of this operation are dealt with in a later chapter.

We do not advocate rapid dilatation of the cervix by the use of branched metallic dilators. These instruments are obsolete now and they had better be discarded from the obstetric armamentarium.

2 *Prolapse of the Cord* This is an occasional complication in the course of delivery of the breech. It is due to the fact that the breech does not fill the pelvic brim and thus allows of a communication between the fore and after waters the force with which the liquor amni may escape when the membranes rupture owing to the tenseness of the bag may sometimes wash the cord in front of the presenting part. The treatment of this condition will be dealt with in the chapter on prolapse of the cord.

3 *Extended Breech* This term is applied to the condition where the breech presents with the thighs flexed on the abdominal wall and the legs extended at the knee. The lower extremities in this attitude act as splints and prevent the movement of latero-flexion from taking place so causing delay in the delivery of such cases.

In extended breech the presenting part may not engage itself at the brim of the pelvis if there is relative disproportion. Such disproportion may be due either to contractions of the pelvis or anomalies of the fœtus such as fœtal ascites tumour of the lower pole of the fœtus etc. or to excessive size of the fœtus.

If there be no disproportion and no abnormality of the foetus, and the extended breech is arrested in its passage through the birth canal, it is best to bring down one foot so that the later complication, impacted breech, may not occur. For this purpose the gloved hand is introduced into the birth canal, with the patient under an anæsthetic, the fingers are then guided along the posterior aspect of the thigh to the knee and gentle pressure exerted in the popliteal space. This will cause the leg to flex at the knee when the index finger is passed along the shin till it reaches the foot and then completes the flexion, so that the foot can be grasped and brought down to the vulva.

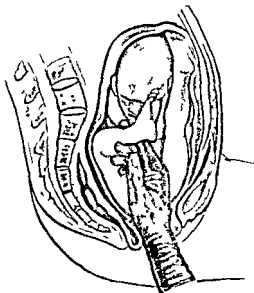


FIG. 117.—Bringing down a foot in extended breech

Should there be no immediate necessity for delivery the case is left to nature.

If labour is progressing favourably and there are no signs of distress either foetal or maternal the extended breech may be delivered spontaneously. But as the extended breech is likely to become impacted it is necessary to be ready to bring down a foot at the first sign of this complication appearing.

4 Impacted Breech This term is applied to the condition where the extended breech has descended into the pelvic cavity and become jammed, further progress being impossible. In such cases the woman presents all the signs and symptoms of prolonged labour and the uterus itself may be tonically contracted.

There are three methods of treatment for this condition —

(a) When a case of impacted breech is met with it is advisable to put the patient under an anæsthetic and find out if the breech is

definitely impacted Occasionally, with the patient under an anæsthetic it is possible gently to push up the breech provided the uterus will permit of this manipulation and then to pass the fingers along the thighs press at the posterior aspect of the knee in the popliteal space and bring down a foot

(b) If however this manipulation is not possible cases of impacted breech may be delivered as such by *traction on the whole breech* carried out by any of the following methods —

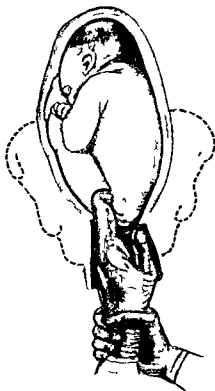


FIG. 118 — Finger tract on in impacted breech

(1) By traction applied with the fingers passed into one or both groins

(2) By traction with a fillet of gauze

(3) By traction with a blunt hook

(1) *By Traction with the Fingers* With the patient under an anæsthetic and after taking the usual antiseptic precautions pass the index finger of the gloved hand into one groin and after steadying it apply traction by catching hold of the wrist of that hand by the other hand and pulling directly downwards and backwards The finger may slip or the traction applied may not be sufficient to bring the breech down In such cases the index fingers of both hands may be passed one into each

groin and traction applied by both fingers simultaneously This is successful in the majority of cases

(2) *By a Fillet of Gauze* A sterile strip of gauze is passed round the groin by means of a male catheter to which it is tied and traction is applied to the groin by pulling on the gauze Care must be taken to see that the traction is exactly along the line of the groin and not towards the thigh as under such circumstances the pressure may easily produce fracture of the femur

(3) *By the Use of the Blunt Hook* This is a hook made of metal semicircular in shape and with a blunt end With the woman under anæsthesia the sterile hook is passed along two fingers introduced into the vagina with the blunt knob of the hook directed posteriorly and when it has come to the level of the groin the

hook is gradually turned at right angles and slipped into the groin, so that the knob of the hook is still directed posteriorly. The object of this is that if the hook by any chance slips, the knob will impinge on the posterior wall of the vagina where no damage is likely to occur, whereas if the knob were directed anteriorly and the hook slipped, the knob would hitch against the anterior vaginal wall and might easily lacerate the anterior vaginal wall and even the bladder. Great and judicious care is necessary in

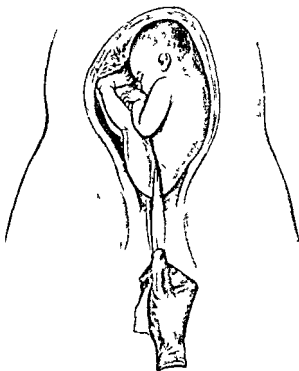


FIG. 119.—Fillet traction in impacted breech

applying traction with the blunt hook, so much so, that some obstetricians would confine its use to cases where the fetus is already dead. We, however, believe that with care it is sometimes possible to deliver a living child without serious damage.

The dangers in the use of the blunt hook are fracture of the femur, laceration of the soft parts, bruising and occasionally rupture of the femoral vessels.

When by one of these methods the breech is brought down beyond the seat of impaction it will be found that its further progress is usually fairly easy, except that the perineum will have

to stretch very much more than in a case of incomplete breech and so an episiotomy may be indicated

(c) A method which has been advocated by some is the use of the obstetric forceps in a case of impacted breech. The forceps is not meant for a breech which does not permit of a proper grip. We have not met with one single case where its application was found necessary.

3. *Extended Arms* The next difficulty that may be met with during delivery is the condition known as extended arm. One or both arms may be extended. If delivery of the actual breech has been spontaneous and voiding traction fundal pressure is applied cases of extended arms are few in number but where it is necessary to deliver a breech by traction extended arms are much more frequently encountered.

After delivery of the breech the obstetrician should allow the trunk to descend pull down a loop of the cord and keep it to one side so as to watch its pulsations and to prevent it from being nipped. If the next few pains do not bring the arms into view the presumption is that they are extended. In such cases traction must be applied to the body of the fœtus till one or other of the axillary folds is visible outside the vaginal outlet. It is a great mistake to pass a hand into the vagina and up to the cervical canal with a view to bring down the extended arm when a portion of the trunk is still in the pelvic cavity as in such cases the arms are generally above the brim of the pelvis and considerable difficulty will be experienced in reaching them. The chances are that in trying to dislodge the arms and bring them down a greater amount of force than is necessary may have to be applied and a fracture of the humerus or clavicle may result. We have found it extremely useful to continue applying steady traction till one or other of the axillary folds is seen well outside the vaginal outlet and only then to pass the index finger of the hand along the back on to the shoulder of the fœtus and work gradually forwards over the anterior aspect of the upper arm till we get to the elbow whereupon the arm is gently swept downwards along the side of the body of the fœtus.

In some cases this manipulation is facilitated by carrying the body of the child forwards towards the mother's abdomen so as to release the posterior arm and conversely by carrying the body towards the sacrum to release the anterior arm. It is not of much significance which arm is released first as in the majority of cases this will depend upon the space available in the anterior or posterior segment of the pelvic cavity. Occasionally it is desirable to rotate the body grasping it high up near the shoulders and rotating it downwards with a view to bring the anterior arm posterior where in the hollow of the sacrum a greater amount of space is generally available.

6 *Dorsal Displacement of the Arm or Nuchal Position* In this condition the arm is extended at the axilla and semi flexed at the elbow so that the forearm rests behind the occiput. Under such circumstances greater difficulty is experienced in releasing the extended arm. Sometimes one arm may be in the nuchal position occasionally both arms may be in this position. In either case the first manipulation consists in rotating the body of the foetus towards the side to which the fingers of the nuchally placed hand are pointing. This releases the arm from the nuchal position but it will still be extended at the shoulder and this condition must be corrected in the manner described above. Where both arms are in nuchal position the manipulation will have to be repeated in a reverse direction to release the other arm.

7 *Difficulties in the Delivery of the After coming Head* Delay in delivery of the after coming head may be due to —

- (a) Defective expulsive forces
- (b) Extension of the head
- (c) Imperfect dilatation of the cervical canal
- (d) Occipito posterior positions of the head

When the uterus contracts upon the after coming head the contractions are in many cases sufficiently strong to expel the head out of the birth canal. Occasionally however this may not suffice and then the head lies in the lower uterine segment or vaginal canal. In such a position the contractions of the upper uterine segment have no effect upon the further progress of the head and so delay in the birth of the after coming head results.

It must be realised that at this stage of delivery delay is dangerous for the cord is being continually compressed and thus the foetal circulation interfered with. Besides this premature attempts at respiration may be made by the foetus due to the impact of cold air on its body. The after coming head has therefore to be delivered promptly within five to eight minutes after the delivery of the trunk.

One of the following methods of delivery may be adopted in such cases provided the cervix is fully dilated.

(a) *Suprapubic Pressure* Where the head is in a flexed condition and no disproportion is present suprapubic pressure may suffice to expel it. Suprapubic pressure to be effective must be done with the woman in the dorsal position and the thighs semi flexed. The operator applies the palmar aspect of his hand to the foetal head through the abdominal wall above the symphysis pubis and presses directly in the axis of the brim of the pelvis.

If this simple manipulation is not sufficient to deliver the

head there are several manœuvres which may be tried; the most important of these are :—

(b) *Prague Method.* To apply this method the patient lies on her back, the right hand of the operator grasps the legs of the child, while the index and middle fingers of the left hand are placed one on either side of the child's neck and the shoulders thus grasped. An assistant now gives effective suprapubic pressure

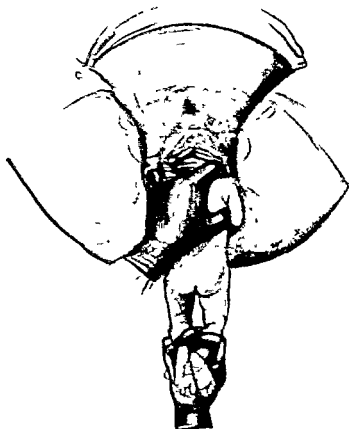


FIG. 120.—The Prague seizure method of delivery of the after-coming head.

while the body of the fœtus is carried forward toward the mother's abdomen, the occiput being kept pressed against the symphysis pubis as the chin, face, brow and vertex appear in turn at the vulva. This method may be applied in cases where the after-coming head is arrested in the pelvic cavity.

(c) *Martin's Method.* In this manœuvre the body of the child rides astride the forearm of the operator, while one finger of that hand is passed through the vaginal canal into the mouth of the child and light pressure applied upon the lower jaw to promote flexion of the head; with the other hand, or preferably, by the

help of an assistant, suprapubic pressure is applied and the head is thus expressed. The finger in the mouth does not act as a tractor but merely keeps the head in an attitude of flexion, so

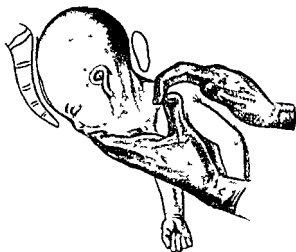


FIG. 121.—Smellie Veit's manoeuvre—method of delivery of the after coming head

that when suprapubic pressure is applied the smallest diameter of head may pass through the pelvic canal

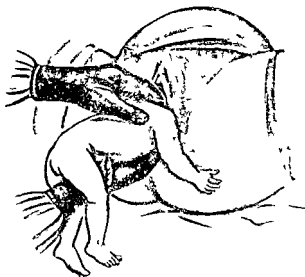


FIG. 122.—Delivery of the after coming head—Smellie Veit's

(d) *Mauriceau Veit or Smellie's Method* Here one arm is passed in much the same manner as in Martin's method, a finger being introduced into the mouth of the child which is supported on the forearm. With the other hand the shoulders of the child are

grasped as in the Prague seizure. An assistant makes suprapubic pressure while the operator delivers the child by gentle traction downwards and forwards.

We have for long adopted a slightly modified form of this manœuvre, wherein we combine the Prague and Martin's methods. The child rides astride the forearm and one finger is passed as far as possible into the mouth, the other hand grasps the two legs of the child and carries them forward over the mother's abdomen while an assistant applies effective suprapubic pressure. Here the finger in the mouth keeps the head in an attitude of flexion. The fingers which grasp the legs carry the body forwards and give the necessary traction while suprapubic pressure effectively given aids the expulsion of the head, and thus delivery is completed in the shortest possible time. We have found this extremely efficacious.

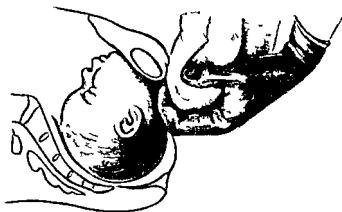


FIG. 123.—Delivery of the after-coming head when the occiput is posterior.

and seldom have we had cause to regret having applied this manipulation in cases where no definite disproportion existed. This method is applicable to all cases whether the head is arrested at the brim or in the cavity.

Several other methods have been described in the literature, the principle underlying these is the same—to promote flexion of the head with a view to making the smallest diameter pass through the pelvic cavity and to supply the necessary force by traction and suprapubic pressure.

(c) *Forceps to the After-coming Head* In the majority of cases one or other of the manœuvres described above will succeed in the delivery of the head, but in a few the delivery is not so easy and the use of the forceps is desirable. Sufficient emphasis cannot be laid on the fact that undue traction or misdirected attempts at traction on the trunk of the child may lead to fracture and dislocation of the upper part of the spinal column, and that excessive and too vigorous suprapubic pressure may result in intracranial

hæmorrhage To prevent such damages it is sometimes necessary to apply forceps to the after coming head, when after trying moderate attempts at traction and fundal pressure the head is not delivered In fact some obstetricians always have forceps ready when dealing with a breech presentation and use it if there is the slightest difficulty in delivery of the head

To apply the forceps an assistant carries the body of the child forward towards the mother's abdomen and the operator introduces the blades one on either side of the head and then applies steady traction We ourselves prefer to apply forceps from below the child's body but in cases where the occiput is posterior it may be advantageous to apply the forceps from above the child's body The e positions refer to delivery in the dorsal position

(f) *Perforation* If forceps fail nothing remains but to perforate through the sub occiput or roof of the mouth and deliver the after coming head We do not consider any other method of treatment justifiable as by this time the condition of the foetus is such that only the mother's safety counts Details of the operation are given in a later chapter

It has been suggested that in some cases of flat pelvis or moderate degrees of outlet contraction postural methods of treatment may be combined with the methods of extraction already referred to—the woman being kept in Walcher's position in a case of flat pelvis and in the exaggerated lithotomy position in cases of contractions of the outlet We refer to this method of treatment as an aid to delivery in a later chapter

A difficulty that may sometimes be experienced in the delivery of the after coming head is its extraction in cases where the occiput is directed posteriorly Such a complication should be extremely rare particularly if the accoucheur has been in attendance from the beginning for as already stated in all cases where the back is posterior if spontaneous anterior rotation does not take place during delivery of the legs a very slight rotation of the foetal pelvis to carry the sacrum anteriorly is sufficient to ensure the occiput being in the anterior segment It may however happen that the trunk is born before assistance is available or the simple manœuvre of rotation referred to may not have been performed and in such cases a dorso posterior position of the head results Even under such circumstances the head may be grasped in the ordinary way employed for the delivery of the after coming head pushed up a little and the occiput rotated forwards simultaneously with rotation of the trunk If rotation is impossible or does not succeed because the head is too firmly fixed in the pelvis or because the chin is caught by the symphysis pubis delivery of the head may be favoured by passing a finger into the mouth of the child and grasping the shoulders with the two fingers of the other hand

The child is first pulled backwards so that the forehead is fixed against the posterior surface of the symphysis pubis and then the trunk is carried upwards on to the abdomen of the mother. If there still be difficulty in the delivery, forceps may be applied. Deep tears of the perineum are inevitable, and it is preferable to perform a prophylactic episiotomy in such cases. Where delivery cannot be effected craniotomy, as has been described above, is the only method of delivery now available.

Fatal Injuries in Breech Deliveries It will be seen from what has been stated above regarding the difficulties in the delivery of a breech presentation that the foetus is liable to several injuries during the course of delivery. They are —

- (1) Fracture of the femur
- (2) Lacerations of the femoral vessels
- (3) Bruising of the abdominal walls and occasionally of the abdominal viscera
- (4) Fracture of the humerus
- (5) Fracture dislocation of the spinal column
- (6) Bruising and rupture of the sternomastoid muscles
- (7) Fracture of the lower jaw
- (8) Injuries to the mouth and pharynx
- (9) Trauma of nerve trunks leading to paralysis
- (10) Contusions spoon shaped depressed fractures of the skull intracranial hæmorrhages tears of the tentorium cerebelli or falx cerebri

The extent of the injuries will depend upon difficulties arising in the course of delivery and the particular method of delivery adopted to overcome them. Ordinarily where no disproportion is present and no complications are met with, foetal injuries are rare if the case is properly conducted.

CHAPTER XXIX

TRANSVERSE OR OBLIQUE LIE

WE have so far described presentations where the foetal lie was longitudinal, in other words, the long axis of the foetal ovoid corresponded to the longitudinal axis of the uterine ovoid. In a transverse lie or as it is sometimes called an oblique lie, the foetus lies generally with the cephalic pole in one or other of the iliac fossæ and the breech at the opposite end of an oblique diameter of the uterine ovoid. A true transverse lie, as such, does not occur in the large majority of instances as the natural tendency is for the

heavier part which is the cephalic pole to slip towards one of the iliac fossæ while the breech passes in the opposite direction and so an oblique lie results

Incidence Transverse or oblique lies are not infrequent At the Women and Children's Hospital, Madras in 20 420 consecutive cases there were 127 cases of oblique lie giving a proportion of 1 in 160 It is more frequent in multiparæ than in primiparæ and occurs oftener in a premature labour than at term

Ætiology The causes of transverse lie are generally those which favour any malpresentation They may be classified under maternal and foetal causes

Maternal (1) Contracted pelvis This condition gives rise to several abnormal presentations and not infrequently the head failing to engage at the pelvic brim becomes displaced towards one or other of the iliac fossæ and thus favours the occurrence of an oblique presentation Particularly should the possibility of this causative factor be investigated when one meets with cases of transverse lie in primiparæ

(2) Placenta prævia

(3) Multiparity if associated with an unduly lax uterine or abdominal wall

(4) Obliquity of the uterus

(5) Hydramnios

(6) Tumours in the region of the lower uterine segment which prevent the engagement of the head at the pelvic brim such as fibroids ovarian cysts and other new growths

(7) Anomalies of the uterus such as a bicornuate or a septate uterus

Foetal Twin pregnancy monsters prematurity and maceration of the foetus

It will be seen that most of the causes are causes which do not permit of the foetal head engaging properly at the pelvic brim and any slight displacement consequent thereon is likely to favour an oblique lie

Positions. When the foetus presents transversely there are four positions that it can occupy corresponding roughly to the four positions in a vertex face or breech presentation The positions are —

Transverse	Vertex	Face	Breech
L D A or L A A	L O A	R M P	L S A
R D A or R A A	R O A	L M P	R S A
R D P or R A P	R O P	L M A	R S P
L D P or L A P	L O P	R M A	L S P

Thus in a transverse lie the head may lie either in the left or right iliac fossa with the back in front or behind When the

head is in the left iliac fossa with the back in front, the presentation is called left dorso anterior or L D A, the dorsum being taken as the denominator

Another mode of nomenclature is to choose the acromion process as the denominator in which case this position would be called left acromio anterior or L A A

Diagnosis The diagnosis of a transverse lie should not present much difficulty if the case is seen antenatally or early in labour

Inspection reveals the fact that the uterus is stretched transversely and that the fundus is at a lower level than the period of pregnancy would warrant

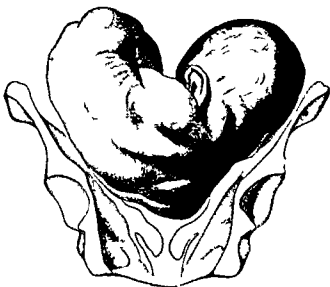


FIG. 124—Left acromio-anterior

Abdominal palpation enables one to recognise that the head is in one or other of the iliac fossae and the breech on the opposite side and at a higher level. In some cases the breech may be in one or other of the iliac fossae and the head in the opposite side of the fundus. Such cases tend to rectify themselves spontaneously into a breech presentation when labour begins.

The fetal heart is generally heard on a level with the umbilicus while in vertex presentations it is heard well below the umbilicus and in breech well above the umbilicus.

Vaginal Examination When the patient is in labour a vaginal examination is of great assistance. Early in labour the signs of abnormal presentation will manifest themselves such as cone shaped bag of membranes, imperfect dilatation of the cervix and after rupture of the membranes the presenting part being high up

the cervical lips hang down loosely. The special signs by which one can recognise a transverse presentation by vaginal examination are the palpation of certain bony landmarks and soft parts. On a careful examination *per vaginam* one may feel the hand, elbow or the shoulder and if the fingers are passed up further the side of the chest may be palpable.

The points of difference between a hand and a foot and between an elbow and a knee have already been discussed. The shoulder can be recognised by palpating the acromion process, the scapula, the clavicle and the axilla. On palpating further the chest of the fœtus can be made out by noting the ribs which run parallel to

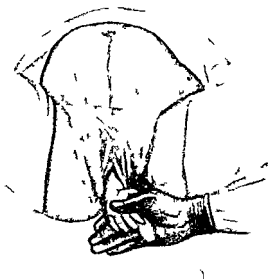


FIG. 19.—Oblique presentation with one hand prolapsed: method of recognising the side to which the hand belongs by shaking hands.

each other. Occasionally, when the presenting part is still high up it may be necessary to put the patient under anæsthesia and make a thorough examination so as to avoid the possibility of mistake. In some cases a foetal hand may be prolapsed but remember that it does not necessarily follow that if a hand is palpated or seen it is a case of oblique presentation as in compound presentations the head and hand may present together. Careful vaginal examination will obviate such mistakes. When the hand is prolapsed in the vagina the side to which it belongs can be determined by trying to shake hands with it.

Course of Labour. Supposing a woman with a transverse lie goes into labour, what may happen to her? It must be clearly realised that a transverse lie offers insuperable difficulties to the

delivery of the foetus. In fact it may be stated that with a normal pelvis and a normally developed foetus at term presenting by the shoulder spontaneous termination of labour is impossible without serious risks to the mother and child. There are a few exceptional ways in which a transverse lie may deliver itself but they are so exceptional that they must never be counted upon. There are three ways in which a transverse lie may terminate spontaneously

- (a) Spontaneous rectification or version
- (b) Spontaneous evolution
- (c) Birth *corpore conduplicato*

In *spontaneous rectification or version* the foetus corrects its malposition by becoming either a vertex or a breech presentation. In such cases when the uterus begins to contract at the onset of labour the contractions may force the breech down towards the brim and the presentation is thus converted into a breech. Occasionally rectification may occur when the head is in the iliac fossa and the uterine contractions may be so directed as to push it towards the brim of the pelvis and thus let it engage. Spontaneous rectification or version may therefore occur due to the activity of the uterus correcting minor degrees of oblique presentation. Such a possibility is more frequent in multiparæ than in primiparæ.

The term spontaneous rectification is sometimes applied to those cases where the correction results in a cephalic presentation whereas if a breech presentation results the term spontaneous version is used.

Spontaneous Evolution. In such cases the transverse lie persists. Very often the hand may also be prolapsed but after the hand has become prolapsed the trunk and breech are forced past the head so that during delivery the shoulder appears first and is followed by the thorax, the buttocks, the opposite shoulder and finally the head. Such a termination generally occurs with unusually small children such as twins or in premature births.

Birth Corpore Conduplicato. This is extremely rare. Unlike spontaneous evolution the foetal head and body enter the pelvis together and the child is born doubled up, the head and feet simultaneously coming together last. Such a termination is only possible when the child is macerated or very premature.

The above spontaneous terminations of shoulder presentation are exceptional and in the great majority of cases the natural powers fail completely to expel the foetus. Under such circumstances when the woman goes into labour the pains will come on at more or less long intervals during the first stage of labour. After a certain time the membranes rupture, stronger uterine contractions develop and a hand is probably prolapsed. With each pain the hand comes down more and more into the vaginal cavity and may

present at the vulva and even the shoulder may be seen. The hand becomes swollen and œdematous and bluish and more severe contractions of the uterus develop. With each successive contraction the foetus is forced down out of the upper uterine segment but cannot escape with the result that the lower uterine segment becomes more and more dilated to accommodate it. The upper segment is contracting and retracting while the lower segment is dilating and the result of this is that the walls of the upper uterine segment steadily become thicker and thicker while the walls of

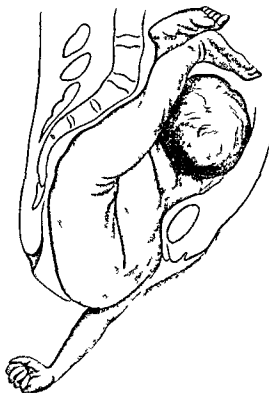


FIG. 16.—Shoulder presentation. Birth, corpore co. 1 pl. cato

the lower segment become more and more thinned out and stretched. The demarcation between the upper and lower uterine segments is marked by the characteristic Brandl's ring or retraction ring which gradually rises higher and higher sometimes reaching as high as the umbilicus. The height at which this ring is noted indicates the extent to which the stretching of the lower uterine segment has taken place and therefore the degree of thinning of its wall. Finally a stage is reached when the lower uterine segment can stretch no more and then one of two events happens, the uterus either ruptures or secondary uterine inertia develops.

When rupture takes place the woman feels a momentary relief as uterine contractions cease but the result of the rupture is that the foetus and placenta may escape partially or wholly into the abdominal cavity. The woman will show signs of shock and collapse due to the rupture of the organ and lacerations of its main blood vessels. In course of time if assistance is not available a fatal termination is inevitable.

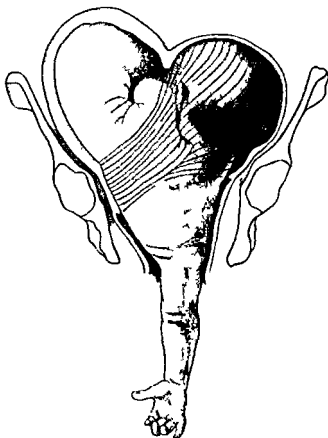


FIG 197 Neglected shoulder presentation. Note the retraction ring.

In cases where secondary uterine inertia occurs the foetus may sometimes survive and be born alive if suitable treatment is available. In other cases death of the foetus is inevitable and the patient herself dies of exhaustion or later of septic complications.

Prognosis In cases which are left to themselves the prognosis is grave both to mother and child. When assistance is available the outlook depends on several factors.

- (1) The stage of pregnancy or labour when the condition is recognised

- (2) The time that elapses before the correction of the malpresentation
- (3) The condition of the uterus and cervix and particularly the condition of the lower uterine segment and the height of the retraction ring
- (4) The time that has elapsed since the membranes have ruptured and the quantity of liquor amni that still remains in the uterus
- (5) Prolapse of the cord as a complication
- (6) Other aetiological factors such as contracted pelvis tumours of the lower uterine segment or placenta prævia

In uncomplicated cases of transverse presentation if properly recognised and suitably treated the prognosis need not be unfavourable to the mother or the child. Owing to risks of interference however it must be definitely stated that a transverse lie increases both the foetal and maternal risks.

Management When a case is diagnosed as a transverse lie it is obvious that it cannot be delivered spontaneously and that interference is definitely indicated. Any delay is dangerous and the sooner the malpresentation is corrected by external combined or internal version the better the prognosis. It must be converted into a more favourable presentation which may be a cephalic or occasionally a podalic presentation. The conversion of a transverse lie into a breech presentation in the absence of any particular contraindication is in our opinion a wiser course as with the slight dislodgement of the breech even if an oblique lie should result it is easier in the subsequent stages of delivery to get at a foot and complete the conversion into a breech presentation. In cases however where an oblique presentation has been converted into a vertex presentation and the head has slipped again into the iliac fossa the arm prolapses and the difficulties in the management of the case are no less.

When a transverse lie is diagnosed first find out the cause of it and if it is due to a contracted pelvis the treatment will depend upon the degree and variety of the contraction. This may be laid down as an axiom for every abnormal presentation because the proper method of treatment for such malpresentations is not the treatment of the abnormal presentation as such but that of the contracted pelvis which is the causative factor.

When a transverse lie is recognised in the later weeks of pregnancy every effort should be made to correct it into a more favourable presentation preferably vertex by external version. We should like however to warn the practitioner against imagining that once a transverse presentation has been corrected into a

vertex or a breech it will necessarily remain as such. It is desirable that the woman should be seen at periodic interval to verify whether the corrected presentation remains as such, and in every case where a transverse lie has been rectified the patient should be warned to summon medical assistance as soon as labour begins and not to walk about in the first stage. We have not infrequently seen cases where, after correction a transverse lie has recurred, and if this warning to the patient is omitted the chances are that she will think that everything is proceeding favourably and thus not summon assistance at as early a stage as is desirable.

It may however, be stated that in many instances a transverse presentation noted say, about the thirty second week, rectifies itself into a vertex at a later stage of pregnancy. This does not however mean that attempts at correction of the presentation should not be made in the antenatal clinic whenever a transverse lie is recognised whatever be the period of pregnancy.

We shall now consider the management of a case of transverse lie in the various stages of labour.

(1) *When the patient comes to you early in Labour, and the Lie is a Transverse one*. Here the remedy is very simple. It must be converted into a more favourable presentation by external version. The conditions necessary for the satisfactory performance of external version are —

- (a) The abdominal wall must be lax
- (b) The uterus must be fairly lax
- (c) The membranes must be intact

After converting it into a more favourable presentation a tight abdominal binder should be applied to prevent the fœtus from changing its position and the woman should lie on her back and not walk about in the first stage of labour.

When external version fails it is better to keep the patient at rest in bed and allow labour to progress till such time as the cervix is sufficiently dilated to permit of bipolar version or in some cases internal podalic version.

(2) *When the woman comes in Labour, with the Cervix Dilated to Two Fingers and the Membranes intact*. In such cases external version may be possible and if it does not succeed bipolar version should be attempted. The details with regard to the conditions necessary and the method of performing bipolar version are described elsewhere. It consists in manipulating with two fingers introduced into the cervical canal and the other hand placed on the anterior abdominal wall and the presentation corrected to a more favourable one by pushing the part that is at the lower pole away and bringing down the cephalic or podalic pole into the brim of

the pelvis Bipolar version is also possible immediately after rupture of the membranes when there is still a sufficiency of liquor amni and it may therefore be tried in such conditions. It is however out of the question if any part of the fœtus has prolapsed through the cervical canal

(3) *Woman in Labour, Membranes ruptured* Before deciding upon any particular method of treatment two conditions must be noted —

- (a) The condition of the uterus
- (b) The condition of the fœtus that is whether it is alive or dead

(a) *Condition of the Uterus* Once the membranes have ruptured the contractions of the uterus become more frequent and the liquor amni drains away with the result that the uterine musculature comes to press upon the fœtus directly. The uterine muscle in a woman in labour may be acting in varying ways at different stages of labour. Thus the uterus may be —

- (1) Contracting and relaxing at intervals as in the first stage of labour
- (2) Contracting at frequent intervals and for fairly long periods with very little relaxation in between
- (3) In a state of continuous contraction with little or no relaxation
- (4) May be tonically contracted so that there is no interval of relaxation at all
- (5) May be tetanically contracted where on a tonically contracted uterus there are superimposed waves of uterine contraction
- (6) Threatening to rupture where owing to continued contractions of the uterus the lower uterine segment has become dilated and the walls thinned out with Bandl's ring high up so that rupture of the uterus is imminent
- (7) Thus may pass on to secondary uterine inertia
- (8) Uterus may have actually ruptured

In any case therefore where interference is attempted after rupture of the membranes in a case of transverse lie it is of the utmost importance that the actual condition of the uterus is first ascertained

In this connection it may be stated that occasionally the Bandl's ring or retraction ring is present on the posterior wall of the uterus and may not be palpable on the anterior wall and not till the patient is under anæsthesia and an attempt at internal podalic version is made is the presence of such a posterior Bandl's ring recognised

(b) *Condition of the Fœtus* Equally important is it to recognise the condition of the fœtus whether it is alive or dead and if alive what are the possible chances of its survival after delivery. Manipulative interference with a view to save the child may necessitate a certain amount of risk being taken so far as the mother is concerned. But it will be entirely unnecessary and unjustifiably hazardous to attempt to do the same manipulative interference when the child is dead.

It is obvious therefore that the particular mode of treatment to be adopted will be determined largely by the condition of the uterus and of the fœtus.

We shall now take the different conditions of the uterus and fœtus above described and deal with them *seriatim*.

(1) *Membranes ruptured Uterus contracting and relaxing Fœtus alive* Here the method of treatment will depend upon the degree of dilatation of the cervix. In some cases where there is no particular necessity for immediate interference it is well to allow the uterus to contract for some time longer and so allow the cervix to dilate further care of course being taken to watch the condition of the uterus and the fœtus. If the cervix is dilated or dilatable there is no object in allowing labour to progress longer and the method of treatment to be adopted is as follows. After the external genitalia have been thoroughly cleansed and due antiseptic precautions taken the patient is anesthetised so as to relax the uterus and abdominal muscles. The hand with a sterilised glove on is carefully introduced into the vaginal cavity passed through the cervix and guided to where the breech is lying. The fingers are pushed along the posterior aspect of the foetal thigh on to the knee and pressure is applied at the popliteal space with a view to promoting flexion of the knee. As soon as the knee is slightly flexed the forefinger may be passed along the shin till the foot is reached and the foot is grasped between the thumb index and middle fingers and gradually brought down. If dilatation of the cervix is complete further delivery may be proceeded with and the breech extracted by gentle traction upon the foot.

If the dilatation of the cervix is not sufficient it is better to bring a foot down to the vulva and leave it there so that the cervix may dilate with further uterine contractions and the delivery be completed spontaneously. We again emphasise the dangers associated with any attempt to deliver a breech presentation through an incompletely dilated cervical canal.

(2) *Membranes ruptured Uterus contracting and relaxing Arm prolapsed Fœtus alive* In such cases the arm if it is prolapsed outside the vaginal cavity should be thoroughly cleansed dried with a sterile towel painted with tincture iodine or any suitable antiseptic and a piece of sterile gauze tied in a loop round the

wrist so as to prevent the arm becoming extended in subsequent manipulations. The patient is anaesthetised and after emptying the bladder the operator passes his hand with the sterilised glove on and performs internal podalic version in a manner similar to that described above. If the cervix is dilated the delivery may be completed, otherwise the foot is brought down and left there and spontaneous delivery awaited or if there is any necessity for interference extraction may be done after full dilatation of the cervix.

(3) *Membranes ruptured Uterus fairly strongly contracting the Arm prolapsed outside the Vaginal Outlet and Fœtal Heart inaudible*. Here as the fœtus is dead there is no object in adopting measures usually taken to save the fœtus. The question naturally arises whether the arm that has prolapsed outside and has naturally been infected should be allowed to recede into the vaginal or uterine cavity. Theoretical considerations warrant the removal of the prolapsed arm to avoid possibilities of septic infection before further manipulations are attempted. On the basis of such considerations after taking due antiseptic precautions disarticulate the prolapsed arm at the shoulder joint and perform internal podalic version and deliver the fœtus in the manner described above. It may be emphasised that the removal of the arm should be by disarticulation whereby the smooth glenoid cavity is exposed and not by amputation which involves cutting through bone and so leaving spicules of the cut end to recede inside and possibly tear the uterus or vagina. We are however of opinion that it is unnecessary to do this mutilating operation for two reasons. The prolapsed arm can be suitably treated with antiseptics so that the possibilities of infection are reduced to a minimum. Secondly and this is the more important consideration we have already referred to the possibility of a Bandl's ring being occasionally present in the posterior wall of the uterus and not recognised by ordinary methods of abdominal palpation. We have experienced considerable difficulty in performing internal podalic version after disarticulation of the arm in the presence of such Bandl's ring and in one instance the patient had to be delivered by Cæsarean section followed by hysterectomy. Where such a Bandl's ring is present and the manipulations necessary to complete internal podalic version are not possible if the prolapsed arm is not disarticulated the next method of delivery namely decapitation is possible. For these reasons we hold that it is unnecessary and occasionally inadvisable to disarticulate the prolapsed arm of a dead fœtus and we have ourselves given up this practice for some years past. We take the usual antiseptic precautions and perform internal podalic version and complete the delivery in the usual manner.

(4) *Membranes ruptured, Uterus contracting strongly with little relaxation, Fœtal Heart audible or doubtful* In such cases the patient should be given deep chloroform anæsthesia and a more thorough examination made by introducing the hand into the vagina. Occasionally it is possible to feel the pulsations of the cord definitely, although the fœtal heart may not be quite so easily audible. In such cases under deep anæsthesia the gloved hand may be passed inside the uterine cavity and internal version performed with care and the child delivered.

(5) *Membranes ruptured, Uterus tonically contracted, Bandl's Ring present Fœtal Heart audible* These cases really present a great deal of difficulty and sound judgment is required on the part of the obstetrician. The essential factor to be remembered is that the fœtal heart is audible and efforts should therefore be made to save the child. The patient should be given $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphia to produce as much relaxation as possible, followed by deep chloroform anæsthesia (surgical anæsthesia), and with great care the operator should pass his hand inside the uterus and gently bring down a foot. Once the foot has been brought down judicious care should be exercised in maintaining a continuous, steady traction, allowing plenty of time for the fœtus to change its lie and for the uterus to accommodate itself to the changed position. Any sudden pull causing a greater amount of tension on one side or other of the uterus is likely to lead to rupture of the organ. In such cases, when the hand is passed inside the uterus, the effect of the uterine contractions is to benumb the hand and make a grip impossible. Occasionally it is wise for the obstetrician to remove his hand which has been practically paralysed and quickly introduce the other hand, seize a foot before the fingers are benumbed and bring it down. It may perhaps be admitted that the manipulations that are required in such a condition are so delicate that only one who has had sufficiently good experience at internal podalic version should undertake them, but in the absence of such experience, and for the beginner, we would definitely advise the next method of procedure, which is a method to be adopted when the fœtus is dead. Frankly a cumbersome and none too delicate attempt at manipulation may provoke rupture of the uterus and may result in a dead fœtus and a dead mother, so that it should not be lightly undertaken by the junior practitioner.

(6) *Membranes ruptured, Uterus tonically contracted, Prominent Bandl's Ring present, Fœtus dead* Here the question of the fœtus does not arise at all, and therefore the operation that we have been describing so far, internal podalic version, is quite unnecessary. Where the uterus is tonically contracted and Bandl's ring is present, we would take into consideration mainly the condition of the fœtus and the possibilities of its survival before deciding on

internal podalic version as a method of delivery. Having therefore ruled out the possibility of internal version what are the methods of delivery available under such circumstances? It depends upon whether the arm of the fœtus is prolapsed or not. If the arm of the fœtus is prolapsed outside the vaginal outlet the operation of choice is decapitation. This is done as follows —

Decapitation. After the usual antiseptic precautions are taken and the bladder has been emptied the prolapsed arm is pulled down the two fingers of the hand of the operator are passed inside so as to locate the neck of the fœtus and a decapitating hook is passed with the knob directed posteriorly round the neck of the fœtus. The head is severed from the trunk. This can also be done and sometimes more effectively by using a long pair of scissors sharp edged and blunt pointed cutting through successive portions of the neck and the spinal column guiding the scissors by the two fingers already introduced into the vaginal cavity. We ourselves prefer decapitation by the use of scissors as a more satisfactory procedure.

After decapitation has been completed delivery is effected by traction on the prolapsed arm when the headless trunk comes out easily. The head is delivered by fundal pressure aided by two fingers in the vagina hooked into the mouth as in a case of the after coming head in a breech presentation. If there is any difficulty in the delivery of the head the head may be grasped by a volsellum perforated and delivered.

Where the arm is not prolapsed and the back of the child is presenting the method of delivery is by spondylotomy. Here the body of the child is cut into two by dividing the vertebral column and after this has been done the two parts of the trunk are delivered one after the other by pulling with volsellum or by a hook. We must emphasise the fact that either after decapitation or after spondylotomy no attempt should be made to pass the hand inside the uterus and bring down a foot. It is obvious that any such attempt defeats the very purpose of these operations and leads to the possibility of rupture of the uterus.

Occasionally one meets with a case where an oblique lie is complicated by a contraction ring so that none of these manipulations are possible. In such cases one has to face the necessity of delivering the fœtus through the abdominal route and performing a hysterectomy at the same time.

Lastly in cases where the uterus has already ruptured and the arm is prolapsed the treatment will naturally be directed to the rupture of the uterus rather than to the malpresentation. We deal with all aspects of this question in the chapter on rupture of the uterus but we may state that where the conservative method of treatment for rupture of the uterus is adopted the fœtus should

be delivered in the manner suggested above by decapitation or spondylotomy if it is possible, and the rent in the uterus treated on the conservative lines which will be outlined later.

We may summarise our treatment of transverse presentation by stating that in uncomplicated cases there should be no serious additional danger either to the mother or to the fœtus if proper steps are taken at an early stage; that in some cases it is possible to convert the presentation into a more favourable one by external version, bipolar or internal podalic version; that the subsequent manipulations necessary to deliver the child need not necessitate any increased risks to the mother; that where unfortunately the woman has been allowed to go on long in labour and is seen at a late stage in the condition known as a neglected shoulder presentation, where the arm has prolapsed and the shoulder is jammed in the vaginal cavity with the uterus tonically contracted and Bandl's ring present, nothing is gained by unnecessary manipulations, especially by those with little or no experience, and the safest line of treatment is to decapitate the fœtus and deliver it. The chances of sepsis must be borne in mind and suitable precautions taken. Where the child is alive, preparations must be made to treat the child after delivery for asphyxia neonatorum which is

CHAPTER XXX

PRESENTATION OF THE CORD PROLAPSE OF
THE CORD

By the term presentation of the cord is meant the condition where the cord lies in front of the presenting part before rupture of the membranes. Prolapse of the cord implies that the cord is in front of the presenting part after rupture of the membranes.

At the Women and Children's Hospital, Madras prolapse of the cord was noted in 83 cases out of 20,420 confinements giving a proportion of 1 in 246.

Ætiology. Three conditions may be said to favour the occurrence of prolapse of the cord

- (1) Factors which tend to interfere with the close application of the presenting part to the lower uterine segment and brim of the pelvis
- (2) An excessive amount of liquor amni, as in hydramnios
- (3) Anomalies of the cord itself, either as regards its length or its attachment to the placenta

(1) *Factors which interfere with the close application of the Presenting Part to the Lower Uterine Segment and Brim of the Pelvis*
In cephalic presentations the head of the foetus usually fills the lower pole of the uterus and generally engages in the brim of the pelvis in the last weeks of pregnancy or at the onset of labour. This may not, however, occur in cases of contracted pelvis, tumours about the brim of the pelvis, placenta prævia and in mal presentations such as face, brow, breech, transverse or compound presentations. All these conditions, therefore, may be factors in the causation of prolapse of the cord.

(2) *Hydramnios* In this condition two factors are involved in causing prolapse. Owing to the excess of liquor amni the presenting part does not fill the lower uterine segment or fit at the brim of the pelvis, and in many cases an abnormal presentation also co-exists. The second factor responsible is that in such cases, because of the free communication between the fore waters and after waters, when the membranes rupture the gush of liquor amni frequently washes the umbilical cord down in front of the presenting part, and so a funic prolapse results.

(3) *Anomalies of the Cord* An unduly long cord may occasionally cause prolapse. The normal length of the umbilical cord varies between 18 and 22 ins. Cases, however, are on record where the cord measured as much as 36 to 40 ins. and in such cases there is a possibility of the cord slipping in front of the presenting part, more so if one of the other factors mentioned above be also present.

When the cord is attached to one edge of the placenta—and that is the lower edge—there is a greater tendency for a portion of the cord to slip in front

For the same reason a low insertion of the placenta may cause prolapse of the cord

Any of the factors mentioned above may cause pre-entation of the cord and every case of pre-entation of the cord unless rectified in time will lead to its prolapse. In several cases more than one factor may be responsible for the condition

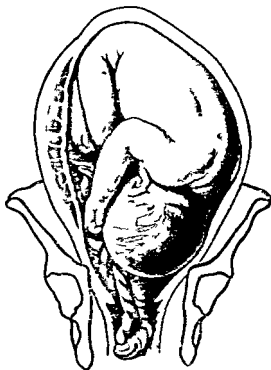


FIG. 128—Prolapse of the cord

Course In the absence of complications such as contracted pelvis, malpresentations etc. the course of labour may not be interfered with on account of this condition, but if unaltered labour will end in a still birth. As however in the large majority of cases of prolapse of the cord some one or other of the complications mentioned above is present the course of labour is greatly altered.

Diagnosis The diagnosis of this condition is fairly simple and depends upon vaginal examination.

In pre-entation of the cord the pulsations of the cord may frequently be felt through the intact membranes. When the cord has prolapsed a loop may be seen lying outside the vagina and the

diagnosis is obvious but when it is still within the vagina or high up it may sometimes be mistaken for intestines of the foetus or the mother—more often the former which may occur in a case of *exomphalos*. If the cord pulsates there is no likelihood of any mistake being made but care should be taken to see that the cord is not unduly compressed for any length of time as this increases the shock to the foetus and favours asphyxia. The cord can be distinguished from a prolapsed intestine by the fact that with a piece of bowel foetal or maternal the mesenteric attachment can always be defined whereas the umbilical cord is free. It must be remembered that the child is not always dead even though pulsations in the cord are absent. Occasionally during a uterine contraction the pulsations may cease but return when the contraction passes off or in some cases the pulsations have just ceased but the child is still alive. It is a wise precaution therefore to auscultate for the foetal heart sounds if the pulsations are not easily felt by vaginal examination. The warmth of the umbilical cord the fact that it is still fairly full and the condition of the uterus suggest the possibility that the pulsations have stopped recently. It is important to note these points as under such circumstances rapid delivery wherever possible may save the child.

It is again stressed that in all cases of labour where the presenting part is not fixed in the brim of the pelvis a vaginal examination is essential as soon as the membranes rupture to see if prolapse of the cord has occurred. Irregularities in the rate of the foetal heart sounds during the first stage of labour indicate interferences with the foetal circulation and the possibility of a funic presentation must be fully investigated.

Prognosis—Foetal The chief danger of this condition is to the foetus. The foetal mortality is very high. The prognosis is worse when the presentation is cephalic than when it is pelvic. It also depends upon the following additional factors—

- (1) Presence of complications such as contracted pelvis
placenta previa hydramnios
- (2) The degree of the dilatation of the cervix and whether
the cervix is soft and dilatable
- (3) Whether the patient is a primipara or a multipara
- (4) Whether the uterus is contracting or not
- (5) The extent of the prolapse
- (6) The nature of the treatment adopted

Maternal So far as the mother is concerned in the absence of any complications prolapse of the cord need not render the prognosis worse but as the condition is more often associated with some complications and as in the large majority of cases

interference is called for in the interests of the fœtus the prognosis for the mother also is rendered less favourable

Treatment The treatment to be adopted in any particular case depends upon several factors. Among these may be mentioned —

- (1) Whether the membranes are intact or ruptured
- (2) Whether the fœtus is premature or at full term
- (3) The condition of the fœtus as indicated by the umbilical cord pulsating or pulseless
- (4) The extent to which the parturient canal is dilated or dilatable
- (5) Whether there is a malpresentation and if so of what variety
- (6) Any contraction of the pelvis and the degree of such contraction
- (7) Whether the patient is a primipara or a multipara

Presentation of the Cord In this condition it is well if possible to find out the underlying cause. Where it is due to definite contraction of the pelvis and the consequent non-engagement of the presenting part the treatment is naturally directed to deal with the contracted pelvis. In other cases our first object is to prevent rupture of the membranes so that the condition may not become one of prolapse of the cord.

Postural Treatment Presentation of the cord may be corrected by the postural method, this consists in putting the patient in a posture where the fundus of the uterus is at a lower level than the lower uterine segment. The cord then gravitates towards the fundus in consequence of the presenting part receding from the lower uterine segment.

The postures adopted are —

- (1) Knee chest or knee-elbow position
- (2) Trendelenburg position
- (3) The elevated Sim's position

When any of these three positions is adopted the pelvis is elevated and the chest and upper abdomen lowered. After the cord has slipped away from the lower pole of the uterus the woman is made to lie on her back and the presenting part is pressed down into the brim of the pelvis and a tight abdominal binder applied. It is however necessary to watch the fœtal heart carefully from time to time and if there be any irregularity to make a vaginal examination to ascertain whether the cord has once more slipped down.

Where the conditions are favourable it is advantageous to convert the presentation into a breech as in such cases the cord is less likely to be compressed than in a cephalic presentation. In

cases where the cervix is fully dilated or nearly fully dilated and the presenting part is not fixed it is well particularly in multiparæ to perform an internal podalic version after rupturing the membranes and deliver the fœtus.

Prolapse of the Cord In the treatment of this condition two factors should be definitely ascertained —

- (a) Whether the cord is pulsating or has recently stopped pulsating
- (b) The causative factor responsible for the prolapse

Whenever the condition is diagnosed immediate interference is indicated if the child is to be saved. It is well to raise the foot of the bed and keep the pelvis elevated so as to prevent pressure by the presenting part on the prolapsed cord while preparations are being made.

If the cord is pulsating the treatment consists in —

- (1) Reposition of the cord or
- (2) Immediate delivery

Reposition of the Cord This may be done either by means of an instrument—the funis repositor—or by means of the fingers. In either case considerable help can be obtained by putting the patient into one of the postures recommended for correction of presentation of the cord and then replacing the cord either by the funis repositor or where it is possible by the fingers. Occasionally the whole hand may have to be introduced into the vagina and uterus to allow of the prolapsed cord being carried beyond the presenting part and so the patient must be anaesthetised in the

Trendelenburg position. After reposition of the cord the woman must be made to lie on her back, and to prevent the cord from getting prolapsed again it is advantageous to insert a hydrostatic dilator such as Champetier de Ribes bag. The bag if properly used will fill the lower uterine segment prevent the cord from becoming prolapsed will stimulate the uterus to contract and uniformly dilate the cervix when it is expelled the whole genital passage will have been dilated and so be ready for immediate delivery. In case there is any tendency for the cord to prolapse again delivery can be expedited by version or, where it is possible by the application of forceps. If a

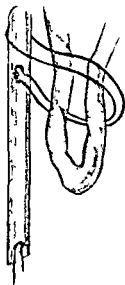


FIG. 111. Reposition of the prolapsed cord with a repositor.

hydrostatic bag is not available attempts should be made to get the presenting part fixed after reposition of the cord. This can be done by the application of a tight abdominal binder and by stimulating the uterus to contract with a small dose of pituitary extract ($\frac{1}{2}$ c c)

In some cases where the cord is replaced by a funis repositor there may be a tendency for it to prolapse again when the funis repositor is being withdrawn and in such cases it is as well to leave the repositor *in situ* after replacement and allow labour to progress.

In cases of elderly primipare in conditions where the pelvis is contracted in cases of placenta previa or when the life of the foetus cannot be jeopardised owing to a long period of sterility of the mother it is sometimes necessary to resort to Cæsarean section.

Where the cervix is one or two fingers dilated and somewhat hard and rigid Cæsarean section may be the only method of saving the life of the foetus but where it is undervalen the foetal heart must be definitely audible and the child at or near term.

If the os is fully dilated or nearly so there is little advantage in trying to replace the cord and risking the possibilities of a prolapse occurring again. In such cases immediate delivery is the safest method. The method adopted depends upon the part presenting and whether or not it is fixed. Wherever the presenting part is not fixed internal podalic version may be performed and the child delivered. In those cases where the os is not fully dilated but is dilatable the os should first be fully dilated before version and extraction are attempted. Similarly in cases where the head is fixed it may sometimes be advisable to extract it with forceps should conditions for the safe application of forceps be present.

If the cervix is not fully dilated and the cord prolapsed and pulsating but not replaceable the cervix may have to be dilated manually or cervical incisions made according to the method advocated by Dührssen. In some cases a vaginal hysterotomy may be indicated. Whatever method of completing cervical dilatation is adopted the child is finally delivered by version and extraction or by forceps.

Where conditions are not favourable for immediate delivery it is sometimes desirable to replace the cord, convert the presentation into a breech and leave the delivery to nature watching the foetal heart carefully from time to time.

If the cord is cold and pulseless and the foetal heart inaudible consideration for the foetus does not arise and interference is only necessary to deal with any underlying causal condition which will endanger the mother's life. The large majority of cases may be left to nature and spontaneous delivery awaited. Where spontaneous delivery does not take place if the head is presenting this may be completed by forceps or if necessary after craniotomy.

In cases where the breech is presenting extraction is undertaken and if there is any difficulty with the after coming head perforation may be performed. The most conservative method of treatment which is consistent with the interests of the mother should be adopted.

In cases where prolapse of the cord occurs and the foetus is not viable the treatment outlined for the condition when the cord is pulseless should be adopted.

COMPOUND PRESENTATION

By this is meant the condition where more than one part of the foetus presents at the brim of the pelvis at the time the patient goes into labour.

Varieties The commoner forms are (1) Head and hand and (2) head and foot. More rarely the hand and foot may present

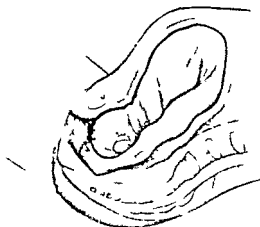


FIG. 170. Compound presentation: head and foot.

together, and rarer still head, hand and foot may all three present simultaneously.

Ætiology Compound presentation may occur either in cases of contracted pelvis or in cases where the pelvis is too roomy, as in the pelvis equilater justomajor. In some forms of contracted pelvis such as the flat variety the head does not engage and hence it is occasionally possible for a hand to slip alongside the head. In the justomajor pelvis the roomy inlet may permit of the hand slipping past the side of the head even when it has engaged. With a premature foetus the same condition may result with a normal pelvis owing to the relative disparity in size between the presenting part and the pelvic inlet.

Diagnosis It is impossible to diagnose this condition by abdominal palpation. A vaginal examination is the only method

of diagnosis available. A cursory vaginal examination may reveal the presentation of the hand or foot and may, in the first instance, mislead the obstetrician into believing that he is dealing with a case of transverse lie or breech presentation. But if a more thorough examination is made of the presenting part it will be obvious that the hand lies to one side and that the cephalic pole is presenting. In some cases the hand may actually be lying outside the vulva while the head is in the pelvic cavity. More

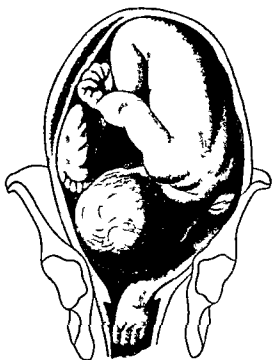


FIG. 131.—Compound presentation—head and hand

rarely we have seen the foot prolapsed outside with the head either in the pelvic cavity or at the brim.

The cord may occasionally be found prolapsed together with any of these conditions.

Course. In a compound presentation the simultaneous attempt at engagement of two parts of the foetus naturally results in a degree of disproportion so that unless the pelvis is very roomy or the foetus is premature delay in labour is bound to occur. Where the pelvis is roomy or the foetal parts comparatively small in size the uterine contractions may be sufficiently strong to force the parts down and spontaneous delivery may thus take place. Owing to the delay however the foetus is subjected to a greater amount of risk. In the majority of cases of compound presentation such a favourable termination does not occur. There is obstruction to

Care must be taken in applying forceps to see that the arm is not caught between the blades of the forceps

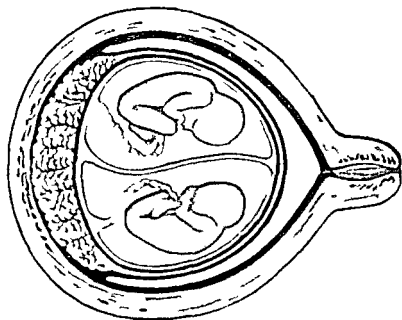
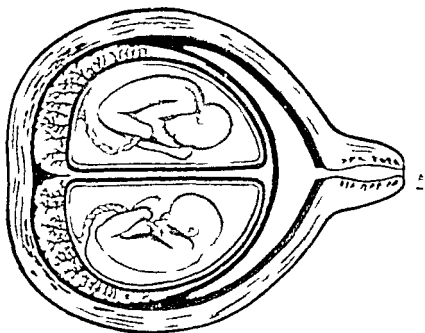
If the foetal heart is inaudible and the child is obviously dead the head may be perforated and delivery effected

2 **Head and Foot** This is a rare condition and in the majority of cases if the head is not actually engaged in the brim of the pelvis the child may be extracted after pulling upon the prolapsed foot thus converting the presentation into a breech.

Where however the head is trying to engage in the brim of the pelvis the foot may be pushed upwards and the head fixed in the brim by combined manipulation. If the head has already engaged in the brim with the foot alongside and the foot cannot be pushed up labour may be allowed to progress provided a careful watch is kept. At any time when signs of foetal distress arise the head can be extracted with forceps.

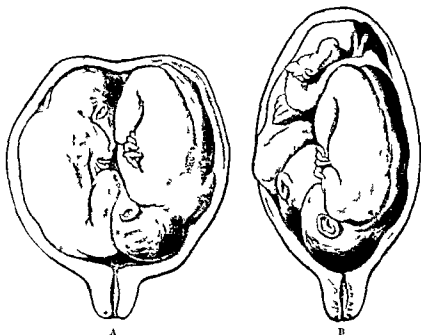
If the child be dead and the head is engaged craniotomy may be done and delivery completed if there is delay.

Prolapse of the Cord with Compound Presentation. The treatment in such cases is directed mainly to the condition of prolapse of the cord irrespective of the fact of the compound presentation. Whenever possible it is desirable to complete delivery by version and extraction. The general principles to be borne in mind have been dealt with in the chapter on prolapse of the cord.



Varieties There are two varieties of twins commonly noted namely uniovular and binovular twins

Uniovular twins result from the fertilisation of a single ovum whereas *binovular twins* are derived from separate ova. Uniovular twins are always of the same sex and resemble each other very closely. There is one common placenta and only one chorion although there is a separate amnion for each foetus. Occasionally the amniotic membranes may fuse or atrophy, leaving both foetuses to occupy a common space bound by the chorionic membrane. In binovular twins there are always two separate placentae which



A

FIG. 133—Twins

B

A Vertex and breech.

B Both vertex

are occasionally fused to each other thus giving the appearance of a single one, but they are essentially separate and there is no intercommunication between their circulations. Each foetus has got its own chorionic and amniotic sacs. The foetuses may be of the same or of different sexes and they may not resemble each other closely.

Twins are usually smaller than the child of a single birth but the combined weight of the two is greater than that of a single child. In the majority of cases delivery is premature probably due to the greater distension of the uterus caused by the plural pregnancy. In some cases the twins differ considerably in size which may be due to the relatively larger amount of blood supply passing to one foetus at the expense of the other. This disproportion

in the placental circulations may sometimes be so extreme that one foetus monopolises practically the whole of the blood supply and consequently the second twin dies. In such cases of intra uterine death the foetus gradually becomes dried up and mummified and because of the pressure exerted by the remaining living and growing foetus is so compressed and flattened that it becomes known as a *fœtus papyraceus*.

Presentations Malpresentations are more frequent in plural births which also tend to be associated with hydramnios. In the majority of instances twin pregnancies present as both vertex or as

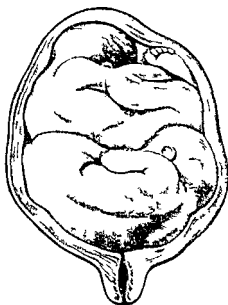


FIG. 134.—Twins both transverse

vertex and breech. The following combinations of presentations are in their order of frequency —

Both vertex	Vertex and shoulder
Vertex and breech	Breech and shoulder
Both breech	Both shoulders

Course of Pregnancy There is a greater liability for the subjective symptoms of early pregnancy to be exaggerated in cases of twin pregnancy. Thus nausea and vomiting are often excessive and persist for a longer period than in a single pregnancy. Owing to the unduly enlarged size of the uterus and the greater amount of pressure exerted on the abdominal viscera and surrounding structures pressure symptoms may also manifest themselves in the course of pregnancy thus œdema of the lower extremities, varicosity of the veins, constipation, frequency of micturition and difficulty in respiration with palpitation and pain in the pericardial

region are not infrequent. The patient may experience a greater amount of fatigue, headache, indigestion, sleeplessness and difficulty in locomotion on account of the distension and the increased pressure. All the symptoms will be exaggerated in cases where hydramnios coexists with twin pregnancy. Premature labour is likely to be more frequent in cases of twin pregnancy than in single births. There is a greater tendency for the toxæmias of pregnancy to manifest themselves in the later weeks of a twin pregnancy than in a single one.

Diagnosis. Twins are more easily diagnosed than triplet or quadruplets. In fact it may be stated that triplets and quadruplets have been diagnosed generally after radiographic examination.

It is difficult to make a positive diagnosis by abdominal examination unless it is possible to make out with certainty essential parts of the two fetuses, such as two cephalic poles. The diagnosis is usually obvious on radiographic examination.

Inspection. The greater amount of uterine distension suggests the possibility of a twin pregnancy. In some cases the excessive amount of foetal movement felt by the patient all over on either side of the abdomen and occasionally seen by the obstetrician on inspection leads one to suspect a twin pregnancy.

Abdominal Palpation. It is here that careful palpation may give reliable evidence of a twin pregnancy. To be definite one must feel the cephalic poles of both fetuses distinctly. Occasionally it may be possible when the woman is in labour to make out the presence of one cephalic pole distinctly by vaginal examination and feel the other at the fundus by abdominal palpation.

Auscultation may be useful as a confirmatory sign but we would not rely on the auscultatory findings alone to make a diagnosis. If two independent observers listening simultaneously hear two foetal hearts distinctly at two different areas well separated from each other, the foetal heart rates differing in frequency by at least ten beats, the possibility is that it is a case of twin pregnancy.

In case where twin pregnancy is suspected it is wise to obtain an X-ray photograph to confirm the diagnosis, particularly in those cases where the associated condition of polyhydramnios obscures both the palpatory and auscultatory signs.

Course of Labour. In an uncomplicated case of twin pregnancy labour may not begin till full term. In the majority of cases however premature labour occurs. The first stage of labour is usually prolonged because of inefficient uterine contraction. Owing to the small size of the fetuses delivery is generally spontaneous.

The usual course of events is for the first child to be delivered spontaneously, after which the woman has a short period of rest. Generally within half an hour the pains once more increase in

severity, the second bag of membranes ruptures and the second child is delivered followed shortly afterwards by the delivery of the two placentæ. Occasionally the interval between the delivery of the first child and the second child may be prolonged and last for a few hours, or very rarely for a whole day. Cases are on record where two or three days have elapsed between the delivery of the first child and that of the second child but these are exceptional. Equally rare is it to find that after the delivery of the first child the placenta of the first child follows. Yet another rare complication is that the placenta of both twins may be expelled after the delivery of the first child in which case the death of the second twin is inevitable unless its immediate delivery is effected.

Prognosis—Maternal The prognosis for the mother is definitely worse than in single pregnancy. During the course of pregnancy the mother is more liable to certain complications. The increased tendency for toxæmia such as hyperemesis albuminuria and eclampsia, the possibility of hydramnios and the pressure symptoms from an overdistended uterus all add to the risks during pregnancy.

During labour the prolongation of the first stage, the necessity for interference to facilitate delivery and the possibility of post partum hæmorrhage increase the risks.

Fatal The foetal prognosis likewise is not so good as in single pregnancies. One of the main factors concerned in this is the prematurity of the fetuses. Occasionally one fetus may develop at the expense of the other so that the prognosis for one of the twins is very much worse.

The prognosis in cases of triplets and quadruplets is poor as in most cases the labour is premature and the children very small.

Management of Labour While in the majority of cases of twin pregnancy an attitude of watchful expectancy is all that is required during the management of labour, occasionally complications arise of a serious nature which require active interference.

In longitudinal lies the first child should ordinarily be delivered spontaneously. Occasionally where the first stage is prolonged it may be of some help to rupture the membrane, the uterine contractions increase in force due to the escape of liquor amni and the relief of the overdistension. From another point of view this is desirable as a prolonged first stage increases the risks of postpartum hæmorrhage later.

After the delivery of the first child the cord is ligatured at two places and cut between. Then the uterus is palpated to determine the presentation and position of the second twin. Usually this is easy to determine as at this stage the uterus is relaxed and the foetal parts can be readily made out. We have however noticed that occasionally a large interstitial fibroid has been mistaken

for a second twin, and even intra uterine manipulations attempted with a view to deliver the supposed twin. A little more care in abdominal palpation, combined with vaginal examination if necessary, should enable one to avoid such a mistake.

After the birth of the first child it is well to allow the mother a short period of rest. In cases, however, where the second twin is presenting transversely, a podalic version should be done immediately by external manipulation. If this does not succeed we prefer to allow the woman to rest for about half an hour, at the end of which period, when the uterus has regained its tone, the patient is anæsthetised and internal podalic version performed and the second foetus extracted.

If the second foetus is presenting in the longitudinal lie and is not delivered within an hour the membranes should be ruptured. If the uterine contractions are not effective to deliver the foetus, Kristeller's method for aiding expulsion of the foetus may be attempted. Should this fail and the ineffective labour pains continue a small dose of pituitary extract (2 to 3 minims) may be given subcutaneously, or occasionally 3 or 4 drops of pituitary extract may be instilled intranasally. It is desirable to avoid the application of forceps as, with the head fairly high up and with a premature foetus, the chances of intracranial injury are much more pronounced. If, however, the uterus is contracting and the foetal head is in the mid cavity and signs of foetal distress manifest themselves, forceps may be applied and delivery completed. Where the head, however, is high up a much safer method of delivery, both for the mother and the child, is under anæsthesia to perform internal podalic version and deliver.

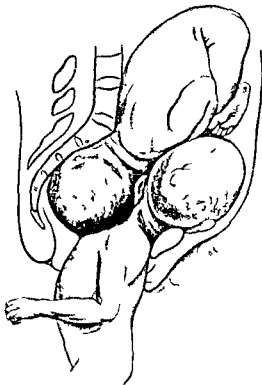
The management of the third stage of labour in cases of twin pregnancy requires great attention. As a measure of precaution everything necessary for the treatment of postpartum hæmorrhage should be readily available. Undue haste either in the delivery of the second foetus or in the expulsion of the placenta is to be avoided and when hæmorrhage does occur it must be promptly treated.

It is well to remember that in some cases postpartum hæmorrhage may occur at a late stage, an hour or two after the expulsion of the placenta. The obstetrician should therefore watch the patient carefully, and should not be satisfied that hæmorrhage will not occur unless the uterus has been firmly contracted and retracted for at least an hour after the expulsion of the placenta.

Anomalies of the placenta may also be met with, particularly the form known as membranaceous placenta. In such cases expression may fail and manual removal of the placenta becomes inevitable.

Complications Apart from such complications as prolongation of the stages of labour, prolapse of the cord and the possibility of premature separation of the placenta interlocking of the twins may occur. While this is a complication of a somewhat serious nature it must be stated that it is exceedingly rare. The impression that locked twins is a common complication in the delivery of twin pregnancies is incorrect.

Several varieties of interlocking of twins may be met with. By the term interlocking we mean that the delivery of one twin



(2) *When one Child is presenting as a Breech and the other as a Vertex* interlocking may occur. The chin of the after coming head of the first foetus may be caught by the chin of the second foetus or some portion of the cephalic pole of the second foetus may try to enter the pelvis and cause obstruction to the progress of the after coming head of the first child.

(3) *First Child Breech Second Child Transverse*. Here the after coming head of the first may get caught by the trunk of the second child lying across the pelvic brim and so further progress is impossible.

(4) *One Child presenting as a Vertex the other as an Oblique*. Here the shoulders or neck of the first child may be caught by some portion of the trunk of the second child lying transversely, thus impeding the progress of the head of the first child.

The diagnosis of this condition is made by a careful vaginal examination whenever difficulty is experienced in the delivery of the first child. An anaesthetic is necessary to make a thorough examination and determine the cause of the obstruction.

Treatment—(1) *Where Dystocia is due to the Engagement of both Heads in the Pelvis*. In this condition the patient should be placed in the Trendelenburg position, and under a general anaesthetic the whole hand introduced into the vagina and the second head pushed up out of the pelvis. The first foetus may then be extracted with forceps and the second child allowed to be delivered spontaneously, but if immediate delivery is indicated it is carried out by version or by the application of forceps depending upon the position of the head and its relation to the pelvic cavity. If however the second head cannot be dislodged forceps may be applied to the fore coming head and delivery attempted by gentle traction. If this does not succeed the condition of the first child does not warrant any further attempts to save it. Craniotomy should be performed and delivery of the first child effected and followed by extraction of the second.

In rare cases of interlocking provided both foetuses are alive and near full term it may be justifiable to perform a Cæsarean section and thus save the twins.

(2) *Interlocking of the After-coming Head of the First Child with the Fore-coming Head of the Second*. This is perhaps the more common form of interlocking met with. In such cases the head of the second child should be dislodged and pushed up. If this is found impossible the only course open is decapitation of the first child which is already partly born and then extraction of the second twin followed by the expression of the decapitated head of the first child.

(3) *Interlocking in Longitudinal and Oblique Presentation of Twins*. Under deep anaesthesia the second child should be pushed

out of the way if possible and the first child extracted. Should this, however, not be possible, the only course open in the majority

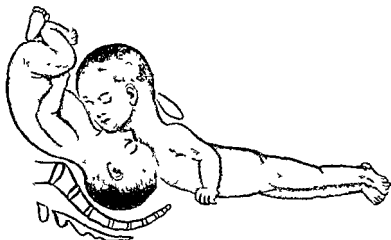


FIG. 136.—Interlocking of twins chin to chin



FIG. 137.—Interlocking of twins

Note that the after coming head of the first is obstructed by the chest of the second

of cases is to sacrifice the first child either by decapitation or by craniotomy when the second twin is extracted after internal podalic version

To summarise then the treatment of interlocking of twins consists in disentangling the interlocking by pushing the obstructing portion of the second fœtus up and so permitting delivery of the first fœtus. Where this is not possible the first child has generally to be sacrificed so that the second which has a more favourable prognosis can be delivered.

Lastly we may in this connection refer to another condition that may occasionally be mistaken for interlocking of twins namely double monsters. They present difficulties in diagnosis and the treatment of this condition has already been dealt with in detail.

CHAPTER XXXII

DYSTOCIA DUE TO ANOMALIES OF THE EXPULSIVE FORCES

THREE factors are concerned with the phenomenon of labour and delivery of the fœtus. For a safe delivery to occur it is necessary that —

- (1) The fœtus should be of normal proportions and should present in an attitude of universal flexion with the most favourable part of the fœtus viz the vertex, as the presenting part.
- (2) The forces of labour—and by this we mean the contractions of the uterus and the expulsive efforts of the abdominal muscles which come into play late in the second stage of labour—should act in a physiological manner till the expulsion of the fœtus and the third stage of labour are completed.
- (3) The passages bony as well as soft should not interfere with the descent of the fœtus as it goes through the various movements described collectively as the mechanism of labour.

Dystocia may therefore be due to —

- (1) Faults in the passenger the fœtus
- (2) Faults in the forces
- (3) Faults in the passages

We have already dealt with most of the faults in the passenger and the difficulties that may arise therefrom together with the particular method of treatment that should be adopted in each case. We are now to consider the faults in the forces which may interfere with the normal course of labour.

The more common anomalies of the expulsive forces are due to —

- (1) Unduly strong uterine contractions
- (2) Weak uterine contractions
- (3) Irregular uterine contractions

(1) When the uterus is contracting too strongly it may lead to —

- (a) Precipitate labour
- (b) Tonic contraction of the uterus

(2) When there are weak uterine contractions the condition may be due to —

- (a) A sluggish uterus with weak pains from the onset of labour generally spoken of as *primary uterine inertia* or
- (b) An exhausted uterus where after strong contractions the uterus has passed into a stage of exhaustion or atony
This condition is spoken of as *secondary uterine inertia*

(3) Irregular contractions of the uterus may lead to the formation of a contraction ring in the second stage of labour or an hour glass spasm in the third stage or to tetanic contraction of the uterus

Each of these conditions will be dealt with *seriatim*

Precipitate Labour

Labour is said to be precipitate when it terminates in considerably less time than is taken on an average either by a primipara or a multipara.

The *etiological factors* concerned in this condition are not easily determined. It occurs more frequently in multiparae than in primiparae and is probably due to the fact that the soft parts are relaxed and the passages including the patulous external cervical os are in a way prepared by previous deliveries. It is more likely to occur in women with justomajor pelves and a foetus of normal size or in premature labours. We have seen precipitate labour occurring in certain cases of cardiac lesion and in women with extreme types of anaemia. Occasionally it may also occur in complications such as pneumonia during the course of pregnancy. It is not possible to anticipate this course of events except in those cases where a previous history suggests the possibility of precipitate labour occurring again. In such cases the patient ought to be advised not to risk any violent jolting or long distance rides in automobiles and to avoid making sudden efforts of any nature. The uterine contractions may come on at very short intervals and are of longer duration so that the contractions are almost continuous till expulsion of the foetus is completed.

Complications Lacerations of the cervix, vaginal walls and of the perineum may occur. The chances of postpartum hæmorrhage are greater in such cases, as after such strong expulsive efforts of the uterus within so short a time uterine exhaustion supervenes in the third stage of labour.

In some cases inversion of the uterus may also take place. Because of lacerations and the impossibility of making adequate antiseptic preparations for delivery, puerperal sepsis is more likely to develop.

Fœtal complications also arise. The rapidity with which the fœtus is expelled may cause trauma with intracranial hæmorrhage and possibly asphyxia. Occasionally, the fœtus may be expelled when the patient is in a standing posture and thus sustain serious injuries, or the cord may snap and hæmorrhage take place before assistance is available. The shock associated with rapid expulsion of the fœtus may also increase its risks.

Prognosis—Maternal The risks are greater in view of the complications, such as tears of the cervix, vagina and perineum, postpartum hæmorrhage and acute inversion of the uterus.

Fatal The outlook is not so good on account of the trauma, the increased shock and the possibilities of laceration of the cord.

Treatment The condition is hardly ever recognised until it has occurred. In cases with a previous history precautions might be taken to see that the patient is placed in bed and assistance is available as soon as the first signs of labour appear. In such cases it may be desirable to give a light anæsthetic to prevent the strong uterine contractions from beginning at too early a stage. After delivery the patient is carefully examined for any tears which are sutured with due anti-septic precautions.

The third stage of labour must be carefully watched.

Tonic Contraction of the Uterus

In this condition the uterus is in a state of continuous contraction, so that there is no relaxation and no rhythmic action of the uterine musculature. The condition generally develops in those cases where there is some insuperable obstruction to delivery, the upper uterine segment begins to contract and retract, pushing the fœtus down, while the lower uterine segment expands, thus accommodating a portion of the fœtus as it is being forced down by the contractions of the upper segment. In the normal course of events long before the lower uterine segment expands to any dangerous extent, the fœtus passes through the pelvic canal and is born. But should an obstruction arise in the birth canal the increasing contractions of the upper uterine segment fail to expel the fœtus, and in such cases the uterus may pass into a stage of

tonic contraction, which later leads to uterine exhaustion or rupture of the uterus. With each contraction the upper and lower segments of the uterus become more definitely differentiated due to the retraction of the muscular fibres of the upper uterine segment and the stretching of the muscular fibres of the lower uterine segment. The muscular wall of the upper uterine segment thus becomes thicker and thicker while the muscular walls of the lower segment become thinner and thinner. The demarcation between the upper and lower uterine segments becomes very prominent and a well defined ridge known as a *retraction ring* or *Bandl's ring* may be made out by abdominal palpation.

From what has been stated above it is obvious that the differentiation between the upper uterine segment and the lower uterine segment is a physiological phenomenon which occurs in the course of every labour but if labour is normal the thinning out of the lower uterine segment is strictly limited and therefore the differentiation between the thickened upper uterine segment and the thinned-out lower segment is not sufficiently marked to be felt clinically as a distinct ring or ridge but in obstructed labour this physiological ring becomes much more marked and assumes a pathological significance. The height at which the ring is felt is an additional indication of the extent to which the obstruction has caused thinning and dilatation of the lower uterine segment. The presence of a ring high up denotes danger for if help is not available and the uterine contractions persist the limit of expansibility and thinning of the lower uterine segment will be reached and rupture of the uterus will take place.

Another point to be noted in such cases is the thickening of the round ligaments which stand out as tense cords on either side. They contract and retract in a manner similar to the upper uterine segment and therefore become markedly exaggerated in thickness when the upper uterine segment is in a state of tonic contraction.

Ætiology The causes of tonic contraction are obvious. In the majority of cases it occurs in obstructed labour the uterus acting strongly in an attempt to overcome the obstruction which may be due to faults in either the passages or the passenger.

Administration of certain ecboic drugs such as ergot or occasionally pituitary extract if given in unsuitable doses or without proper indications may produce tonic contraction.

Signs and Symptoms—General The following general signs and symptoms will be noticed. The mother has an anxious expression is restless complains of severe and continuous abdominal pain the pulse is rapid temperature elevated tongue dry sordes may collect round the lips and gums and cold clammy sweats break out. Occasionally nausea and vomiting may also be present.

Local Signs These are referable to the uterus and vagina

On abdominal palpation the abdomen will be found to be tender the uterus is very hard the round ligaments prominent & definite ring Bandl's ring or the retraction ring may be present running obliquely or transversely across the uterus showing the differentiation into lower and upper uterine segments. The level at which this ring is present is an indication of the amount of stretching of the lower uterine segment and the likelihood of rupture of the uterus occurring if immediate assistance is not available. Because of the tense uterus the foetal parts cannot be defined. The foetal heart sounds cannot be heard distinctly on auscultation indeed they are frequently absent as the child has died because the continuous contraction of the uterine wall has cut off the maternal side of the placental circulation.

On vaginal examination the vagina is found to be dry and hot the presenting part is firmly fixed in some portion of the pelvic canal & a large caput succedaneum is present obscuring landmarks on the presenting part and causing the obstetrician to be misled as to its true level the cervix is oedematous and there may be oedema of the vagina and perineum.

Clinical Course When the uterus is in such a condition of tonic contraction if assistance is not available to complete delivery one of two results supervene (a) secondary uterine inertia or exhaustion (b) rupture of the uterus.

The possibilities of rupture are imminent and it involves certain death of the foetus and grave risks to the mother.

In cases of secondary uterine inertia the uterus may regain its tonus after a period of rest and then expel the foetus. In some cases the foetus dies and is retained and intrapartum infection develops.

Other incidental risks are that the continued and prolonged pressure of the presenting part on the birth canal may lead to necrosis followed later by sloughing and fistula formation. There is a greater risk of septic complications and the possibility of deep tears of the vagina and perineum in the subsequent course of delivery owing to the sodden condition of the soft parts.

Diagnosis The general condition of the patient the abdominal tenderness the hard contracted uterus with the prominent round ligaments presence of Bandl's ring and the vaginal signs enumerated above complete a picture which ordinarily enables one to diagnose this condition with ease.

The only other condition with which an unfortunate mistake may be made is uterine exhaustion. The differential diagnosis between these two conditions is dealt with later.

Prognosis—Maternal Tonic contraction is undoubtedly attended with grave risks to the mother if not treated promptly it may lead to rupture of the uterus. Even where treatment is

available the exhaustion the possibilities of postpartum hæmorrhage that may supervene later and the chances of infection all add considerably to the risks

Fœtal The fœtal prognosis is very grave. In a very large number of cases the fœtus dies due to direct compression exerted by the uterus as the liquor amni has all drained away

Treatment—Prophylaxis This consists in a careful examination of the case both antenatally and early in labour correcting any malpresentations or malpositions and treating the case with due regard to such factors as are likely to cause obstruction during the course of delivery. Never give ergot or other oxytocic in the course of labour before the fœtus has been expelled. Pituitary extract ought to be given with great care. The indications and contraindications for the use of this drug are dealt with separately

Curative When a case of tonic contraction of the uterus is met with the patient should be given a dose of morphia ($\frac{1}{4}$ grain) and put under chloroform anæsthesia while everything is prepared for immediate delivery. No intra uterine manipulations such as version should be attempted unless one is satisfied that under the influence of a general anæsthetic a certain amount of relaxation of the uterus is possible which will warrant such interference. Immediate steps should be taken to deliver the fœtus in the most conservative manner particularly in view of the fact that in the majority of cases the fœtus is already dead. Craniotomy decapitation spondylotomy embryotomy are some of the measures that may be needed to deliver the dead fœtus depending of course upon the presentation and position

Uterine Inertia Sluggish Uterus Weak Pains or Primary Uterine Inertia

In this condition the uterine contractions are weak few and far between from the onset of labour and occasionally may even cease altogether after a time. The force of uterine contractions varies in different individuals and is generally greater in the young than in the relatively old and in primiparæ than in multiparæ but in ordinary circumstances is sufficiently strong to effect spontaneous delivery

Causes May be divided into general and local

General causes pertaining to the mother —

- (1) Poor general health due to lack of proper nutrition
- (2) Chronic wasting diseases
- (3) In some types of neurotic women the pains may be weak from the very beginning possibly an endocrine factor is also associated with this condition

Local May be attributable to —

- (1) The uterus
- (2) Faults in the passenger
- (3) Faults in the passages

(1) *Uterine Causes* —

- (a) Overdistension of the uterus as in hydramnios twin pregnancy or abnormally large children and monsters
- (b) Abnormal positions of the uterus such as anteversion with a pendulous abdomen
- (c) Diseases of the uterine wall—chronic metritis, endometritis etc
- (d) Developmental errors such as an infantile type of uterus
- (e) Tumours of the uterus as fibroids
- (f) Previous abdominal operations producing adhesions which interfere with the muscular activity of the uterus

(2) *Faults in the Passenger* —

Abnormal positions of the fœtus such as breech shoulder face brow occipito posterior

Conditions due to twin pregnancy abnormally large child and monsters producing overdistension of the uterus and thus causing primary uterine inertia have been referred to above

(3) *Faults in the Passages* —

- (a) Contracted pelvis
- (b) Full bladder and rectum
- (c) Tumours of the adnexa in the pelvis such as dermoid cysts of the ovary

A full bladder and rectum prevent the proper course of labour by causing reflex nervous inhibition

Clinical Features In cases of primary uterine inertia there is little or no progress although the woman has been in labour for several hours. Cervical dilatation is slow or stationary and after the membranes have ruptured a caput succedaneum does not form. Ordinarily there is no danger to the child and the maternal pulse is not increased or the temperature elevated.

The inertia is generally more marked in the first stage of labour than in the second stage but in some cases it may occur in the second stage as well for quite a prolonged period. The small infrequent pains may however cause a certain amount of exhaustion to the mother because in such cases they are tearing and ineffective. The exhaustion is also due to the want of rest and lack of proper sleep but does not usually affect the general condition of the patient.

Diagnosis is comparatively easy. The weak nature of the

pains the ineffective contractions and the slow progress of labour together with the absence of any signs of exhaustion as manifested by a rise of temperature or increased pulse rate will enable one to diagnose the condition of primary uterine inertia. The pains have little or no effect on the foetal heart.

The only condition with which it may have to be differentiated is an exhausted uterus or the condition known as secondary uterine inertia the differential diagnosis between which is dealt with later.

Prognosis The outlook depends on the cause. The maternal prognosis is worse because of the greater risks of sepsis due to the frequent internal examinations that may have to be made and the manipulations necessary for completing the delivery.

Foetal prognosis is also worse as prolongation of the stages of labour has an adverse effect in increasing the chances of intracranial stress and asphyxia.

Treatment—Prophylaxis To avoid the possibility of primary uterine inertia antenatal care is of great use and if properly applied should in a large number of cases prevent the incidence of this complication. This in part is due to gaining the patient's confidence before labour begins.

General measures to increase the strength of the patient to improve the blood picture and if possible the tone of the uterus should be adopted during pregnancy. Such pathological factors as may lead to this condition should also be corrected antenatally.

Curative—First Stage It is generally believed that no harm results either to the mother or to the foetus so long as the membranes are intact whatever be the duration of labour in a case of primary uterine inertia. While subscribing to this view in the majority of cases our experience leads us to state that in a few the foetus may be endangered even before the rupture of the membranes. We have noted, particularly in primiparae that the continuous pressure on the head as it lies in the pelvic cavity increases the congestion of the intracranial vessels and so the risk of cerebral haemorrhage. Sudden variation of the foetal heart rate is noted in these cases. We are therefore not quite so emphatic that no harm can result to the foetus so long as the membranes are intact.

In the first stage sedatives such as bromide and chloral should be given to promote rest and sleep. At the same time the general strength of the patient must be maintained by glucose and light nutritious drinks. The bladder and rectum must be emptied. The patient must be assured and her confidence gained. In the majority of cases after a sleep labour pains start with greater vigour and generally delivery ends spontaneously.

Second Stage During this stage it is not necessary to be unduly alarmed at the delay and no useful purpose will be served by counting the number of hours after rupture of the membranes in

deciding if interference is necessary. In many cases an attitude of watchful expectancy will be rewarded by a successful termination of labour and save both the mother and the child. We have left such cases alone in the absence of pains occasionally for twenty four hours or even longer. Two things must however, be carefully noted (1) The condition of the fœtus by frequent careful auscultation of the fœtal heart, and (2) the avoidance of repeated vaginal examinations as far as possible. Where any variations of the fœtal heart are noted, it is necessary to make a vaginal examination and note the presence or otherwise of a caput. We hold that a large caput is a more important indication for interference than slight variations in the fœtal heart and the absence of a caput points to there being no immediate necessity for interference.

If the cervix has not dilated sufficiently, a chloral and bromide draught is beneficial in helping the cervix to relax, and hot vaginal douches sometimes favour the dilatation. When the cervix has sufficiently dilated and the greatest diameter of the head has passed through the brim of the pelvis, if labour drags on because uterine contractions are not sufficiently strong, the uterine muscle must be stimulated. Small doses of pituitary extract, $\frac{1}{6}$ to $\frac{1}{4}$ c.c. and not more, may be given. When the uterus has begun to contract if the pituitary extract does not complete the delivery, artificial assistance in the shape of forceps for cephalic presentations or extraction in breech cases may be needed. In the majority of cases the use of pituitary extract will save the necessity for artificial interference.

If the delivery is effected with the precautions stated above, the third stage of labour need not give rise to any anxiety.

In primary uterine inertia as opposed to uterine exhaustion the power of retraction is not lost to the uterine muscle, and therefore postpartum hæmorrhage is not a complication generally met with. If however, without attempting to stimulate it at first, delivery is hurried when the uterus is in a condition of inertia, postpartum hæmorrhage is likely to ensue.

Secondary Uterine Inertia or Uterine Exhaustion

As the term signifies this condition develops after the uterus has been contracting normally for some time. It is generally the result of delay in labour due to some obstruction to the progress of the fœtus. The uterine contractions start therefore in a normal manner and at first continue to recur with increasing intensity and frequency but owing to obstruction or other causes labour does not progress and the uterus becomes exhausted with the result that the pains after gradually weakening finally cease.

Ætiology (1) Factors concerned with obstruction to labour —

- (a) Obstruction due to contraction of the bony pelvis or of the maternal soft parts such as rigid cervix, tumours about the brim of the pelvis, rigid perineum, etc
- (b) Abnormalities of the foetus as regards presentation, position, size and deformities

(2) Factors in relation to the uterus, such as —

- (a) Weak uterine musculature as from multiparity
- (b) Overdistension of uterus from hydramnios or antepartum hæmorrhage

(3) Lack of or inefficient contractions of the accessory muscles of labour, that is, the abdominal and other voluntary muscles

Symptoms The chief point to remember is that labour starts as in a normal case and the uterus begins to contract with increased frequency and force, but there is no advance of the foetus and finally the pains gradually become more and more feeble and die away

Secondary uterine inertia generally occurs in the second stage of labour

Differential Diagnosis Secondary uterine inertia should be differentiated from primary uterine inertia on the one hand and tonic contraction of the uterus on the other. It is important to differentiate between the three conditions as the treatment to be adopted is quite different in each of them and any mistake will lead to serious consequences for the mother

(A)

	<i>Primary Uterine Inertia or Weak Pains</i>	<i>Secondary Uterine Inertia or Uterine Exhaustion</i>
1 General condition of patient	Fair, no marked exhaustion	Signs of marked exhaustion, elevation of temperature and pulse rate may be present
2 Stage of labour	Starts in the first stage	Generally occurs in the second stage after rupture of membranes
3 Uterine contractions	Weak from the onset of labour	Contractions start in the usual manner but become weaker later and finally subside
4 Foetus	Condition of foetus not generally affected	Foetal heart rate may vary and indicate foetal distress, a large aput may be present
5 Signs of prolonged labour	No signs of prolonged labour such as retraction ring or prominent round ligaments	Signs of prolonged labour may be present such as retraction ring prominent round ligaments and a dilated lower uterine segment

(B)

*Secondary Uterine Inertia**Tonic Contraction of the Uterus*

1 General condition of patient	Patient is fairly quiet but signs of exhaustion are present	Patient is restless anxious and complains of severe pain
2 Pulse, respiration and temperature	Pulse and temperature raised, but not very much, respirations may be normal	Pulse rapid, respiration hurried, temperature raised
3 Abdominal palpation	Abdomen not tender uterus may be relaxed and the foetal parts may be easily palpable	Abdomen very tender uterus hard foetal parts cannot be distinctly made out, Bandl's ring may be very obvious and round ligaments prominent
4 Foetal heart	Can be heard easily	May not be heard on auscultation even when the foetus is alive
5 Vaginal examination	Findings may vary, depending on what degree of severe contraction of uterus have been present prior to the onset of inertia	Vagina is generally hot and dry, oedematous large caput present presenting part jammed at some level in the pelvis

Prognosis This depends on the aetiological factors concerned. It is serious for the mother owing to the increased necessity for interference, the chances of postpartum hæmorrhage and the possible risks of infection.

Foetal prognosis is also grave, more so if factors such as contracted pelvis or malpresentations are responsible for the obstruction to labour.

Treatment The first thing to realise in the treatment of this condition is that one is dealing with an exhausted uterus, and following the general principles of treatment for all kinds of exhaustion it is necessary to give the exhausted organ sufficient rest in order that it may recoup its power. Any attempt to stimulate the uterus at this time will lead to disastrous results. Such overstimulation may temporarily force the uterus to contract and delivery may be effected with assistance, but as soon as the child is born the uterine exhaustion will assert itself to an even greater degree and result in a very severe form of atonic postpartum hæmorrhage.

The main consideration, therefore, in the treatment of secondary uterine inertia is to give rest to the tired uterus. This may be done by administering sedatives, such as chloral and bromide morphia tincture opii or scopalamine. It is well to empty the bladder and rectum and ascertain definitely what factors are causing the obstruction. The patient will generally sleep for some time, and when she wakes up rested the possibilities are that the pains will reappear and be satisfactory. General stimulants such as glucose may be administered. When the pains have returned, but not till then, should any attempt be made to deliver the foetus.

Symptoms Very few symptoms manifest themselves in fact the general condition of the patient does not indicate that a contraction ring has formed nor can the ring be recognised by abdominal palpation. It is only on making a detailed vaginal examination usually following an unsuccessful attempt at delivery, that the presence of a contraction ring is diagnosed.

Diagnosis The only way to diagnose a contraction ring is to feel it by vaginal or intra uterine examination.

The following points drawn up by Clifford White will be found useful when making a differential diagnosis between a contraction ring and a retraction ring.

CONTRACTION RING

Local girdle of thickening which may be found at any site in the uterine wall.

Uterine wall is thicker at the ring than above or below.

The wall of the lower uterine segment is neither thinned-out unduly nor distended.

Presenting part is not forced down into the pelvic girdle and jammed.

Child may be completely above a contraction ring.

Uterus is relaxed between the pains.

It may form at any stage of labour and does not change its position.

It is never felt by abdominal palpation.

The patient does not present any disturbing general signs of distress.

Caused by premature rupture of the membranes and intra uterine manipulations.

RETRACTION RING

Junction of thinned out lower uterine segment and thick contracted upper uterine segment.

The wall is thicker above and thinner below.

The wall of the lower uterine segment is thinned and distended.

Presenting part is wedged in the pelvic girdle.

Child will never be completely above a retraction ring.

The whole uterus is tender and retracted and no relaxation occurs.

Formed late in obstructed labour and rises to a higher level above the symphysis pubis.

Is always palpable when pathological unless it only develops posteriorly.

The general condition of the patient is obviously serious.

Is produced in the course of untreated obstructed labour.

Prognosis Once a contraction ring has formed it shows no tendency to relax and it presents one of the most difficult problems in obstetrics to overcome.

The maternal prognosis is serious as the condition causes severe dystocia and delivery presents unusual difficulties.

The foetal prognosis is very bad. Over 80 per cent of the children die.

Treatment As a contraction ring is a localised spasm of the uterus it has been suggested that anti-spasmodics might produce relaxation. The drugs recommended and used are amylnitrite in capsules and epinephrin. Deep chloroform anaesthesia in combination with morphia may be tried but is not always successful.

If relaxation does not occur steady continuous traction on the presenting part does in some cases help to promote relaxation and facilitate delivery. In cases of vertex presentation Willett's forceps may be fixed to the scalp and traction applied by a weight acting over a pulley as in cases of placenta prævia.

If the foetus is dead a cranioclast may be applied to the head and continuous traction by a weight then exerted. In cases of breech presentation a similar method of treatment may be adopted by applying traction to a foot after it has been brought down to the vulvar orifice.

If however such methods fail or where the lie is an oblique one only one alternative is possible namely Cæsarean section. Version should never be attempted in such cases as the contraction ring makes it impossible to change the position of the foetus and if undue force is exerted the uterus will be ruptured. Where infection is suspected especially in cases where the patient has been subjected to repeated attempts at delivery it is wise to do a Cæsarean hysterectomy.

The phenomenon of *hour-glass contraction* which occurs in the third stage of labour is described in the chapter on postpartum hæmorrhage.

MISSED LABOUR

This is a rare condition where labour starts at the expected time at full term but instead of continuing normally comes to an abrupt end and the foetus dies. The foetus may be retained in the uterus for a variable period. The condition is analogous to that of missed abortion where in the early weeks of pregnancy the ovum dies and is retained in the uterus sometimes for days sometimes for weeks and even months.

Causes are not definitely known. It is probable that it may be associated with some disturbance of the endocrine system or of the sympathetic nervous system or both.

Diagnosis. The size of the uterus and the height of the fundus should be noted. In cases of missed labour the height of the uterus will be stationary and in some cases it may even be less than at full term. The foetal heart is not audible and if one finds that there is no enlargement of the uterus after observing it from two to four weeks missed labour should be suspected.

The only condition with which it may sometimes be mistaken is an abdominal pregnancy with death of the foetus. In this condition however the foetal parts can be felt more easily on abdominal palpation and occasionally the uterus may be palpated as a distinct mass from the foetal sac. The history if carefully gone into may also be significant as symptoms referable to ruptured ectopic pregnancy in the early weeks of gestation may be elicited.

A radiographic examination may sometimes be of help in the differential diagnosis of the two conditions.

In the absence of facilities for a radiograph a sound may be passed into the uterine cavity and the length of the cavity will decide the nature of the enlargement whether it is intra or extra uterine. There need be no hesitation in attempting to pass a sound in such cases as occasionally it not only helps to diagnose the condition but also facilitates the treatment namely, the induction of labour in such cases.

Occasionally pregnancy may be prolonged beyond the fortieth week. The foetus continues to grow in the uterus, but this condition need not be confused with that of missed labour as if the foetal heart is audible the diagnosis is obvious that it is one of prolonged gestation and not of missed labour.

Treatment Where a definite diagnosis of missed labour has been made it is necessary to induce labour. The methods of induction of labour will be dealt with elsewhere.

Medicinal methods of induction of labour or rupture of the membranes by passing a sound may be attempted. In some cases if the uterus fails to respond it may be necessary to perform a vaginal Cæsarean section and deliver the foetus. The actual delivery of the foetus should be done by conservative methods as far as the mother is concerned inasmuch as the foetus is already dead and occasionally macerated. Accordingly perforation and other forms of embryotomy may be undertaken so as to save a laceration of maternal soft parts.

Where the foetus is dead and septic infection is suspected two methods are open. In some cases it may be desirable to deal with it by the abdominal route and perform a hysterectomy at the same time. The other alternative is to do a vaginal Cæsarean section deliver the foetus and drain the uterine cavity.

CHAPTER XXXIII

DYSTOCIA DUE TO ABNORMALITIES OF ANOMALIES OF THE MATERNAL SOFT PARTS

LABOUR may sometimes be delayed or rendered difficult on account of obstruction offered to the foetus by the maternal soft parts. These difficulties may be due to abnormalities of —

- | | |
|----------------|----------------|
| (1) The vulva | (2) The vagina |
| (3) The cervix | (4) The uterus |

In discussing these conditions it is assumed that the bony pelvis is normal and that the dystocia is due to maternal soft

parts only. It is obvious that sometimes more than one factor may be involved in the causation of difficult labour and that both the soft parts and the bony pelvis may be at fault. It is necessary, therefore, to examine both the bony pelvis and the soft passages in every pregnant woman to detect any abnormalities that may lead to dystocia.

1. Abnormalities of the Vulvar Outlet

There are several conditions of the vulvar outlet which may lead to dystocia.

(1) **Atresia of the Vulva** Generally incomplete this is often accompanied by imperfect development of the sexual organs and when pregnancy occurs the second stage of labour is naturally prolonged and may necessitate an episiotomy to avoid extensive perineal tears which may involve the rectum.

(2) **Rigid Perineum** This condition is often met with in elderly primiparæ and also in multiparæ who have had previous perineal lacerations repaired. In the latter a keloid condition may develop increasing the rigidity of the perineum.

The treatment consists in performing episiotomy.

(3) **Œdema of the Vulva** There are many conditions which may cause œdema of the vulva in a pregnant woman or in a woman during labour. In pregnancy it is generally due to toxæmia, renal or cardiac diseases, or anæmia. In such cases it will be noticed that the œdema is present not only in the perineal region but also in the labia majora and minora and is generally bilateral. Œdema of other parts such as the extremities or the face, may also be present. Such a type of œdema does not cause obstruction to delivery, but if marked and causing considerable distress can be treated either in pregnancy or labour by multiple punctures with a needle and the application of hot compresses. During the course of delivery lacerations are liable to occur and these heal badly. It is not desirable in the presence of œdema to suture such tears as occasionally the parts slough and cause septic complications.

There is another type of œdema that occurs in prolonged labour caused by the pressure of the head in the pelvic cavity and obstruction to the circulation of venous blood. This œdema mainly involves the perineum and only to a much less extent the lower part of the labia on either side. It is not associated with œdema in any other part of the body and must be distinguished from that which results from the conditions referred to above. It is a valuable sign of prolonged labour and indicates the necessity for a careful investigation of the cause of the delay. Instrumental aid is often necessary in such cases,

again tears of the perineum in such cases should not be sutured but left so that drainage is free. During the puerperium it may be desirable to treat these lacerations with hot fomentations and dress them with suitable antiseptics such as mercurochrome. When the parts are clean the perineum may be sutured.

(4) **Inflammatory, Malignant and other Lesions** These are comparatively rare but there are two conditions not infrequently met with in the tropics which it is desirable to take note of —

(a) *Elephantoid Growth of the Vulva* This may sometimes lead to severe dystocia. In one case the dystocia was so great that it ended in rupture of the uterus before the woman was brought to the hospital. The head was low down on the perineum but the vulvar outlet was very narrow and barely admitted two fingers due to the rigidity caused by the elephantoid growth of the perineum. In such conditions it is better provided the diagnosis is made sufficiently early to perform a Caesarean section and deliver the foetus. If however the woman is only seen late in labour bilateral episiotomy is carried out before delivery is effected, considerable difficulty is experienced in the healing of the incised wounds in the puerperium. Suturing of such tears serves no useful purpose and is better avoided.

(b) *Healed Scars of Infective Granulomata* These healed scars produce such a severe form of cicatrization that the vulvar outlet becomes considerably narrowed and admits only one finger. In such cases we prefer to perform a Caesarean section as soon as labour begins.

(5) **Hæmatoma of the Vulva** This is a very rare condition met with in the second stage of labour. Because of the pressure of the head and the engorgement of the veins one of the veins gives way and the blood is extravasated into the soft loose areolar tissue of the labium producing a large hæmatoma which impedes the further progress of the head.

The patient experiences intense pain which is sometimes of a tearing nature, and if there is a large extravasation of blood burrowing into the loose tissues round about it may cause general symptoms of internal hæmorrhage.

The usual treatment in a case of vulvar or vaginal hæmatoma is to place the patient at absolute rest in bed. If the course of labour is interfered with on account of the hæmatoma it is not wise to allow the child to be born without first dealing with the hæmatoma. Particular care should be taken not to drag the child past the tumour by applying forceps. With due antiseptic precautions an incision is made into the sac the coagulated blood is cleared out and the cavity packed with gauze. Thereafter the child is delivered if necessary with artificial assistance.

Should the hæmatoma develop after delivery the treatment adopted depends upon the size of the hæmatoma. Where it is a large open sac clear out the clots and pack. If small it may be left to absorb spontaneously. Should suppuration develop it is incised and free drainage established.

Cysts of the Vulva These are usually Bartholin's cysts and rarely obstruct labour. In some cases the cyst suppurates and thus becomes converted into an abscess. It is not desirable to open the abscess till some days after the delivery, but where the abscess wall is tense and is likely to burst in the course of delivery it is better to aspirate and draw off the thin purulent material and seal the opening before allowing delivery to take place. If the purulent material is thick and aspiration is not possible the abscess should be opened after taking precautions to see that the vulva is protected so that none of the purulent material escapes into it. After opening the cavity and draining the interior should be touched with some strong antiseptic such as pure carbolic acid swabbed with spirit to limit the action of the carbolic and then plugged. Great care is necessary during the puerperium when attending to the abscess cavity and swabbing the perineum.

2 Abnormalities of the Vagina

DEVELOPMENTAL ANOMALIES

Incomplete Atresia of the vagina is generally associated with sterility. In cases where pregnancy results the atresia may be so pronounced that vaginal modes of delivery may be out of question. Such cases require a Cæsarean section.

A Double Vagina or a Septate Vagina In cases of double vagina if the septum is complete and involves the cervical canal and the uterus labour is not generally interfered with as one portion of the vagina dilates while the other is compressed by the passage of the foetus. When however the septum is incomplete it may form a definite band in front of the presenting part and thus cause obstruction. It is necessary in such cases to incise the septum and make the vagina one common canal.

Acquired Atresia This is secondary to inflammatory lesions or traumatic causes generally following labour. In some cases the atresia may be so pronounced and the scarring of the vaginal tissues so great that there is no possibility of effecting any dilatation of the vaginal canal. In others again the adhesions may be comparatively light and readily yield to manual or hydrostatic dilatation. Where thick scars are present which do not yield to dilatation or incision Cæsarean section is necessary.

Occasionally the vagina may be encroached upon by tumours in the rectum as for example syphilitic gummata malignant tumours of the rectum or adenomata. In such cases the treatment will depend upon the degree of resulting obstruction. We have met with one case where a gummatus infiltration about the rectum was so pronounced as practically to occlude the whole vaginal canal and necessitated a Cæsarean section.

Vaginal Neoplasms. These may be cystic or solid and are comparatively rare, in cases where it is possible to excise the tumour this should be attempted before delivery is effected. If the tumour however is small and not likely to cause any obstruction labour may be allowed to proceed. The treatment of malignant tumours of the vagina is considered separately in the chapter on tumours complicating pregnancy.

3 Abnormalities of the Cervix

Rigidity of the cervix is one of the causes of delay in labour. Such rigidity may be due to —

- (1) Organic cause or
- (2) Functional cause

ORGANIC RIGIDITY OF THE CERVIX

This may be due to the following causes —

- (1) Inflammatory conditions of the cervix leading to cicatrization
- (2) Trauma of the cervix particularly following child birth leading to irregular cicatrix formation
- (3) Operation on the cervix such as amputation of cervix which results in scarring
- (4) New growth in the cervical canal

In the majority of such cases the cervix dilates in a surprising manner so that during labour the cervix that was considered hard and rigid reaches full dilatation fairly easily. Sometimes however the dilatation is much more difficult and artificial aid may be necessary. Rigidity is greater in those cases which follow certain operative measures such as amputation of the cervix.

Treatment. Sufficient time should be given during labour for dilatation to occur especially when the rigidity is due to scarring from previous inflammation. When the cervix does not dilate and the necessity for interference becomes urgent some method of artificial dilatation must be adopted. The available methods are —

- (1) *Manual Dilatation.* This consists in dilating the cervix with due antiseptic precautions by the fingers. At first the thumb

and index fingers are introduced later the middle finger and so on till all five fingers can be passed and the cervix thus uniformly dilated. Care must be taken to see that the cervix is not forcibly stretched and that the operation is done slowly so as to permit of gradual and uniform dilatation.

Another method of manual dilatation that may be adopted is to introduce the index and middle fingers of either hand and gradually stretch laterally antero posteriorly and diagonally in opposite directions. The patient must be under anaesthesia before attempting either of the methods. Sometimes associated with the organic rigidity there is a certain amount of cervical spasm present as well.

Small tears are almost inevitable but if the dilatation is properly performed in the slow and deliberate manner in which it ought to be there should be no large tears.

After full dilatation the method of delivery depends upon the condition of the foetus and the relation of the presenting part to the pelvis. Where after such manual manipulations tears of the cervix result in the further course of delivery such tears ought to be sutured immediately.

(2) *The Use of the Hydrostatic Dilator* Metreurynters or hydrostatic dilators may sometimes be used in the dilatation of the cervix. The method of using such dilators is described in the chapter on placenta praevia.

(3) *Multiple Incisions of the Cervix* This is a method popularised by Dührssen and can be adopted under certain circumstances. We prefer the manual method of dilatation wherever possible but if the delivery is more urgent or if manual methods do not succeed multiple incisions may be made. Care should be taken to see that the direction of the incisions is such that any extension will not lead to the involvement of the uterine vessels or the bladder. Multiple incisions are also employed to prevent any single tear from extending upwards to involve the uterus and cause a rupture which may open into the pelvic cellular tissue or the peritoneal cavity.

The general directions in which such incisions should be made are represented by the position of the hour hand of a clock at 2, 6 and 10. Occasionally after small incisions the dilatation can be aided by one of the manual methods already described. After delivery the cervical incisions should be carefully sutured to reduce the chance of sepsis and the scarring of the cervix.

We do not advocate dilatation of the cervix by any of the branched metallic dilators. We have never used these instruments in our practice and feel that they are fit only for the museum as relics of a bygone age. The use of such instruments is attended with a great deal of shock irregular tearing of the cervix and consequent hæmorrhage and a much greater risk of puerperal sepsis.

(4) *Vaginal Hysterotomy* Another method of treating organic rigidity of the cervix is by vaginal hysterotomy. If the difficulty is entirely confined to the soft parts and there is no suggestion of any disproportion the operation will prove very satisfactory in selected cases.

In cases where the rigidity is extremely marked as sometimes happens after amputation of the cervix or in certain forms of congenital hypertrophy it may be advisable to perform an abdominal Cesarean section and so save the mother from the ineffectual pains of labour and the risk associated with frequent vaginal manipulations.

FUNCTIONAL RIGIDITY OF THE CERVIX

This is generally noted in elderly primipare or neurotic women who dread the onset of labour. Occasionally it may be due to reflex irritation from an overdistended bladder or a loaded rectum. It is usually recognised in the early stages of dilatation when the cervix is only one or two fingers dilated and the membranes ruptured. It may sometimes occur where the presenting part generally the cephalic pole does not fit the lower uterine segment.

Treatment. Factors responsible for reflex irritation should first be treated. The bladder should be emptied and the lower bowel cleared by means of enemata. The neurotic type of woman must be reassured, freed from the importunities of all anxious relatives and preferably given a sedative such as a chloral and bromide draught or a dose of morphia or scopolamine. When the membranes have ruptured hot douches are very efficacious and should be given at intervals of two hours. The application of cocaine to the cervix occasionally acts well. A plug of gauze soaked in 5 to 20 per cent solution of cocaine hydrochloride is inserted into the vagina. In some cases a plug soaked in sterilised glycerine may serve the same purpose and it is particularly useful where a certain amount of organic rigidity is associated with functional rigidity.

As in cases of organic rigidity there should be no undue haste in dilatation of the cervix. In some cases where the uterine contractions themselves are feeble and occur at long intervals the cervix may not dilate for twenty four hours or over and in the absence of any symptoms of distress foetal or maternal there is no necessity to interfere with the cervix.

If after employing these methods just described the cervix still fails to dilate sufficiently the artificial methods of dilatation used in the condition of organic rigidity may have to be employed such as manual dilatation, metreuryasis or multiple incisions.

Endocrine therapy is being tested in these cases now, but it is too early to form any opinion.

Where the rigidity is extreme and the dilatation of the cervix is very poor, an abdominal Cesarean section may have to be considered.

ŒDEMA OF THE CERVIX

This condition may occur either during the course of pregnancy or during labour.

During pregnancy it may occur in a generalised œdema or sometimes it results from minor degrees of prolapse of the gravid uterus.

During labour œdema of the cervix generally involves the anterior lip, and in the majority of cases it is due to pressure by the presenting part—the head, on the anterior lip before the cervix has been completely taken up and dilated. A vicious circle results in such cases. With a partially dilated cervix the head presenting and pressing upon the anterior lip interferes with the circulation, which results in œdema, and as it increases it in turn causes further obstruction to the course of delivery. In extreme cases of this condition the œdematous anterior lip may be seen at the vaginal outlet, while the head is jammed in the pelvic cavity. Occasionally œdema may be present in the posterior lip of the cervix as well and rarely both lips of the cervix may be equally œdematous completely covering the presenting part and obstructing its progress.

Treatment. In the majority of cases where only the anterior lip is involved it is possible by vaginal manipulation to dilate the cervix sufficiently to push the anterior lip above the presenting part. If the œdema is considerable the anterior lip may be punctured with an antiseptic and the œdema relieved by puncturing with a sharp needle, after which the anterior lip is pushed up above the presenting part.

The same method of treatment should be followed in cases where the posterior lip or both lips are œdematous. Occasionally œdema may be only partially relieved and the cervix may have to be manually dilated before delivery can be effected.

Care must be taken in the puerperium to see that the parts are kept clean and mild antiseptics used occasionally to touch up any lacerations that may have occurred. Occasionally portions of the cervix necrose and slough off or have to be separated during the puerperium.

MALPOSITIONS OF THE CERVIX

Sometimes the cervical canal instead of being situated in the middle of the pelvic cavity, more or less on the curve of Carus is displaced and deviated anteriorly, posteriorly or occasionally laterally. Generally this follows displacements of the body of the

uterus and is very rarely due to adhesions near the isthmus uteri. The cervix may be displaced anteriorly and the external os may be felt actually underneath the symphysis pubis in the condition known as posterior sacculation of the uterus. On the other hand the external os may be in the hollow of the sacrum or occasionally pointing toward the sacral promontory in cases where anterior sacculation has occurred. In some cases lateral deviations of the cervix may also result so that the cervix is pointing to one or other side of the pelvic cavity.

In all these cases considerable difficulty is experienced in the process of dilatation and taking up of the cervical canal when the longitudinal fibres of the uterus contract. Displacements of the presenting part also occur and the force of uterine contractions is directed towards a cupola formed either by the anterior or posterior sacculi so that much of the effect of the uterine contractions is lost. In the majority of cases where extreme degrees of displacement of the cervical canal are not present it may be possible to pull the cervix down by means of a vulsellum and gradually dilate it manually. Given time in most of these cases the obstruction is overcome and the cervix is taken up. Where nature does not succeed incisions of the cervix may be necessary and in the more severe cases vaginal hysterotomy is the method of choice.

CHAPTER XXXV

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

4 Body of the Uterus

DYSTOCIA may result from any of the following causes —

- (1) Malformations of the body of the uterus
- (2) Displacements of the uterus
- (3) Tumours of the uterus and its adnexa or neighbouring structures

MALFORMATIONS OF THE UTERUS

These are caused for the most part by the preservation to a greater or less extent of the septa between the ducts of Muller. It may be recalled that the Fallopian tubes are formed from the upper portions of the Mullerian ducts to their point of union one with the other. From the inferior portions the uterus and vagina are formed by absorption of the fused inner wall. If the absorp-

tion of the inner walls of the ducts does not take place the uterus and vagina are divided into two lateral halves, should however, a partial union take place a corresponding degree of malformation results. There are many degrees of these deformities, depending upon the extent to which the fusion and subsequent absorption is deficient. Five degrees are generally described.

In the *first degree* there is a slight depression in the median line of the fundus resulting in the formation of a horse shoe shaped uterus spoken of as *uterus cordiformis*.

In the *second degree* the septum extends along the length of the body up to the internal os.

In the *third degree* the septum extends not only through the uterine body but also through the cervix.

In the *fourth degree* the septum runs down into the vagina but does not completely divide it.

In the *fifth degree* the septum divides the vagina completely causing the condition spoken of as a double vagina.

It will be readily seen that varying degrees of persistence of the septum will produce corresponding degrees of malformation. In this bifid condition, as well as in cases of a fully formed double uterus, the two sides may be equal or unequal.

Depending upon the degree of the malformation the following conditions are met with —

(1) **Uterus Didelphys** Here there are two separate uterine cavities each communicating with its own cervical and vaginal canal. The two Mullerian tubes have failed to fuse in their lower two thirds. Each uterine horn can therefore be moved apart from the other.

(2) **Uterus Bicornis Bicollis** This differs from the preceding one in that the body of the uterus appears to be made up of one cavity, but there is a slight depression at the fundus and the septum leading from this depression passes right through the cervical canal and vagina thus separating the two halves completely.

(3) **Uterus Bicornis Unicollis** Here there is one cervical and vaginal canal but there is a depression at the fundus with a partial septum which lies in the upper half of the uterine cavity.

(4) **Uterus Septus** The uterus presents the normal shape externally with no depression at the fundus but a membranous septum stretches right up to the external os dividing the body of the uterus and cervical canal into two halves. The vagina is single.

(5) **Uterus Subseptus** This condition is different from the preceding one (4) in that the septum does not extend to the whole length of the uterine cavity being confined to the upper portion for a variable distance.

(6) **Uterus Unicornis** Here the main body and cervix of the uterus have been developed from one Mullerian duct and there

is a rudimentary horn to one side of it the cavity of which usually fails to communicate with either the developed horn or the vagina

Occasionally the uterus itself may be a rudimentary organ or it may be infantile and very much under-developed or again in some cases its development though not complete is still further advanced so that it presents the appearance of an adolescent uterus in adulthood

Rarer still there may be a complete absence of the uterus in some cases In the two last conditions pregnancy does not occur and no question of dystocia therefore arises

PREGNANCY AND LABOUR IN UTERINE MALFORMATIONS

Pregnancy in uterine malformations though rare is sometimes met with In most cases of uterine deformities the two portions of the uterus are not symmetrical and equal Pregnancy occurs usually in one half of the uterus and a false decidua may form in the other half Not infrequently abortion occurs in some cases premature labour is the result occasionally pregnancy goes to term and may end normally

The common complications met with are weak pains postpartum hæmorrhage adhesion of the placenta malpresentations are not infrequent Owing to poor development of the uterus in cases where labour is prolonged or obstructed the uterus may rupture The placenta if it is formed on the septum may be adherent and may cause postpartum hæmorrhage

Uterus Didelphys In this condition as there are two complete uteri each with a distinct body and cervix pregnancy may take a normal course Occasionally delivery may be impeded by the septum in the vagina In the early weeks of pregnancy the presence of the non gravid uterus may give rise to the mistaken diagnosis of an extra uterine gestation or an inflammatory complication of the adnexa In some of these cases menstruation may occur throughout the course of pregnancy from the non pregnant uterus

Uterus Bicornis Bicolis Pregnancy may occur in either horn of the uterus and when it occurs in one horn of a bicornate uterus the other undergoes some degree of hypertrophy and a decidua is formed in its cavity Usually pregnancy takes a normal course and delivery is spontaneous In rare instances the non pregnant horn of the uterus may impede the progress of labour by obstructing the passage of the head in the pelvic cavity It is difficult to make a positive diagnosis till the delivery is completed The presence of a double vagina or a double cervix may possibly give a clue

In the condition of *uterus bicornis unicollis* the difficulty in

diagnosis is even greater, and some cases are not diagnosed till after delivery

Uterus Septus and Subseptus In these conditions pregnancy and parturition generally run a normal course. In some cases the placenta may be retained or adherent, and it is during the manual removal of the placenta that the condition is generally diagnosed. In a few cases the head or other part of the fœtus may pass through the septum.

Labour does not appear to be impeded and generally unless there are other causes the presentation is longitudinal.

In *uterus subseptus* the fundus of the uterus may be normal in outline or occasionally there may be a depression of the fundus. Abortion is relatively frequent and sometimes considerable difficulty may be experienced in removing the placenta. Where a septum is present in the cervical canal difficulties may sometimes arise owing to a portion of the fœtus slipping through the septum and so interfering with further progress.

Uterus Unicollis Pregnancy is extremely rare in this type of uterine deformity.

Pregnancy in the rudimentary horn is attended with grave risks. This complication is dealt with in the chapter on extra uterine gestation.

DISPLACEMENTS OF THE UTERUS

Not infrequently displacements of the uterus occur during the course of pregnancy. The following are some of the common forms of displacements that may occur —

- (1) Backward displacements (retroversion, retroflexion, retroversio flexion)
- (2) Forward displacements (anteflexion, anteversion)
- (3) Downward displacements (prolapse of the gravid uterus)

1. Backward Displacements

Pregnancy may occur in a uterus that has become retroverted or retroflexed previously or a pregnant normally placed uterus may become displaced backwards due to several factors. Of these two possibilities the former is much the commoner.

Causes Backward displacements of the gravid uterus may be brought about in the early weeks of pregnancy by several factors, the more important of which are —

(1) *Sudden Strain* In those indulging in active athletics the sudden strain involved may occasionally produce a backward displacement of the comparatively heavy uterus within the first twelve weeks of pregnancy.

(2) A *chronically overdistended bladder* likewise exerts pressure on the fundus of the growing uterus and predisposes to displacement backwards.

(3) Causes of retroversion of the uterus occurring before the development of pregnancy —

- (a) Congenital origin
- (b) After a previous pregnancy retroversion may develop during the puerperium
- (c) Tumours of the body of the uterus particularly fibroids may exert a pressure backwards and thus cause retroversion
- (d) Old adhesions and increased intra abdominal pressure may favour the condition

In a contracted pelvis particularly of the flat variety the protrusion of the sacral promontory may obstruct spontaneous rectification of the uterus and thereby predispose to incarceration or abortion

Clinical Features At first the condition gives rise to little discomfort. As a rule it is generally after the twelfth week of pregnancy when the uterus is beginning to become incarcerated that symptoms appear. Sometimes however reflex symptoms such as hyperemesis may be marked and are occasionally immediately relieved if the displacement is recognised and corrected.

Bladder symptoms are the commonest. Frequency of micturition followed by retention of urine may be the first symptom to make the patient seek advice. Constipation also occurs in a large number of cases and the patient may complain of backache. In most cases spontaneous rectification occurs that is the condition corrects itself and the uterus becoming anteverted gradually grows towards the abdominal cavity so that there is a relief of the symptoms described above. If such restitution does not occur the following terminations may result in their order of frequency —

- (1) Abortion (2) Incarceration (3) Sacculation

(1) *Abortion* A retroverted gravid uterus has a marked tendency to abort not only on account of the displacement with which is usually associated increased congestion but also because of the increased irritability of the uterus resulting from undue compression together with inflammatory changes so commonly complicating backward displacements of the uterus. Because of the uterine position the abortion is frequently incomplete.

(2) *Incarceration* The uterus may become incarcerated. When the displaced gravid uterus growing within the pelvic cavity fails to undergo spontaneous rectification because of its increasing size it eventually completely fills and becomes wedged in the pelvis the condition being known as incarceration. This is more likely to occur if the pelvis is flattened and there is an abnormal projection of the sacral promontory under which the fundus becomes trapped.

After incarceration the uterus continues to develop in the pelvis. Sooner or later one of three terminations may occur —

(a) The uterus may empty itself

(b) Sacculation of the uterus may occur and pregnancy proceed

(c) The incarceration may become complete when pressure upon the neighbouring organs especially the urethra results. Further growth of the uterus can only occur in an upward and forward direction. This carries the cervix higher and in turn the anterior vaginal wall with the urethra in close relationship to

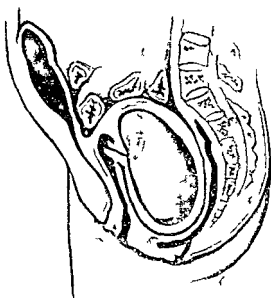


FIG. 138 — Retroverted gravid uterus — incarceration

it are greatly elongated and the lumen of the urethra further constricted. The bladder then becomes much distended as a result of retention of urine the wall hypertrophies becomes œdematous and may undergo necrosis. Following such damage to the bladder a severe septic infection known as an exfoliative cystitis develops and may lead to pyelitis and pyelonephritis. Sloughs of bladder mucosa may be passed *per urethram*. Infection may spread through the bladder wall or the bladder may rupture and cause pelvic peritonitis and later general peritonitis followed by death. Occasionally the uterus may slough and even rupture of the uterus has been recorded.

A rare complication of this condition was noted in one of our cases. A loop of intestine became prolapsed behind the uterus and was strangulated and so caused death. More than any other

	<i>Extra uterine Gestation with Pelvic Hematocoele</i>	<i>Retroverted Gravid Uterus</i>
Hæmorrhage	May be slight externally but marked signs of internal bleeding	External hæmorrhage may be present signs and symptoms proportionate to external blood loss if tending to abort
Bimanual examination	Body of uterus in normal position or slightly tilted upwards with the cervix pointing downwards	Body of uterus absent from the normal position but felt in Douglas pouch the cervix usually tilted upwards and forwards
Swelling	Boggy occasionally pulsatile posteriorly and towards one side of the body of the uterus	Elastic soft swelling occasionally contractile posteriorly in Douglas pouch
Colour of discharge	Rather brownish with occasional gritty particles	May be bright red if aborting
Contents passed	A decidua cast or portions thereof	Portions of the ovum with chorionic villi may be passed

In cases of doubt a small hypodermic needle may be passed into the tumour in Douglas' pouch, when on aspiration clear fluid can generally be withdrawn in cases of a gravid uterus whereas with a hæmatocoele blood occasionally of a dark colour is drawn into the syringe. We attach much significance to this final test in settling the diagnosis.

(2)

*Retroverted Gravid Uterus**Ovarian Tumour in Pouch of Douglas complicating Pregnancy*

ladder symptoms	Prominent and occur early	No such symptoms generally present
swelling	Symmetrical and soft and in the uterus	Usually asymmetrical and of varying consistency and felt apart from uterine body which is usually in an anteverted position
position of cervix	Pointing forwards and upwards and is intimately connected with the swelling moving with it	In normal position or directed posteriorly and does not move with the tumour in Douglas pouch
contractions	Intermittent contractions of the body of the uterus may be elicited.	No contractions of the ovarian tumour occur

(3) A fibroid tumour in the posterior wall of a pregnant uterus in such cases the position of the cervix which will be more or less normal, will be of considerable help. A fibroid tumour in Douglas' pouch is hard and does not contract and is not elastic. It moves with the uterus and cervix, but gives the uterus an irregular outline and the consistency of the whole mass formed by pregnant uterus and fibroid is no longer uniform.

Prognosis In the majority of cases retrodisplacement tends to correct itself by spontaneous rectification. In those cases which give rise to symptoms if diagnosed early it is generally fairly easy to replace the gravid uterus by one of the methods to be described. If, however, the displacement persists beyond the fourteenth week of pregnancy the chances of incarceration are increased with the

associated dangers due to retention of urine leading to cystitis gangrene and ascending infection of the urinary tract. Abortion may ensue. In neglected cases the woman dies of septic infection, uræmia or exhaustion.

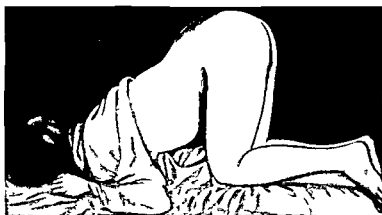


FIG 139 —Knee chest position

Treatment (a) *Before Incarceration* In the early stages the following methods of treatment may be adopted —

(1) *Reposition by Postural Methods* The woman is encouraged to adopt the knee chest or knee-elbow position morning and

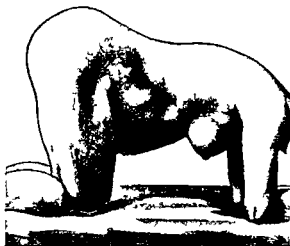


FIG 140 —Knee-elbow position

evening for from fifteen minutes to half an hour. Care should be taken to see that the bladder is never overdistended. The object of this treatment is to favour spontaneous rectification as the uterus grows.

likely to recur as the uterus is by then too large. Once the uterus has become an abdominal organ the pessary should be removed.

Occasionally when the uterus cannot be manipulated into position it is wise to leave the case alone but the patient should be watched carefully to see that neither bladder nor rectum become distended. In some of these cases abortion may occur but in the majority the uterus rights itself and the organ gradually rises out of the pelvis as the pregnancy proceeds.

(b) *After Incarceration* When incarceration has occurred the same methods of treatment outlined above may be tried as a preliminary to adopting one of the methods to be described. It is desirable to keep the bladder empty for twenty-four to forty-eight hours and to treat the condition of cystitis if present. In some cases difficulty may be experienced in emptying the bladder due to the elongation of the urethra and its constriction. It may be necessary to perform a suprapubic cystotomy and drain the bladder if a catheter cannot be passed. In cases of severe cystitis where the bladder requires to be frequently emptied or washed out it is better to leave a catheter *in situ*. After this preliminary treatment efforts at manual reposition should be made. If they are not successful there are two alternatives —

(1) Induction of abortion.

(2) Reposition of the uterus by the abdominal route.

(1) *Induction of Abortion* This is occasionally necessary when the possibilities of survival of the ovum are remote and signs and symptoms of a severe bladder infection are present or the general condition of the patient does not warrant an abdominal operation. In cases where induction of abortion is decided upon two methods may be adopted —

(1) Rupture of the membranes so allowing the liquor amni to drain off.

(2) Dilatation of the cervix.

Considerable difficulty may be experienced in dilatation of the cervix owing to its position. The difficulty in completely evacuating the uterus is not inconsiderable in such cases.

As an alternative it may perhaps be much more satisfactory to perform a vaginal hysterotomy which in most of these cases is not difficult. An incision is made into the uterus posteriorly the uterine cavity opened and evacuated after which it is stitched up.

(2) *Replacement of the Gravid Uterus by the Abdominal Route* This operation is more frequently resorted to now but it must be emphasised that it should be done at an earlier stage and not where the impaction has led to severe inflammation and sloughing of the bladder walls. This operation should be done only when

the bladder has not gone to the stage of gangrene and when there are no symptoms of acute peritonitis. After separation of any adhesions the uterus is replaced and suspended in an anteverted position. After this treatment the patient is given repeated doses of morphin or some other uterine sedative for the first twenty four hours to reduce the possibility of abortion and during the operation itself manipulative measures must be reduced to a minimum and carried out as gently as possible.

A complication of grave significance is the inflammation of the bladder already referred to. It is important to treat this condition during the early stages. Careful emptying of the bladder is necessary. Occasionally gangrene of the bladder with the escape of foul urine and pus and shreds of denuded membrane may occur. When a diagnosis of this condition is made free drainage is absolutely essential. This can be done by the vaginal route by opening through the anterior fornix into the base of the bladder. Urinary antiseptics such as hexamine in one form or other may be administered orally or intravenously.

Occasionally it may be necessary to open the bladder from above. In cases where severe bladder symptoms are present it is not desirable to attempt induction of abortion or undertake any operative methods for the replacement of the gravid uterus till the infection of the bladder has first been brought under control. Once this has been achieved the uterus may be replaced or emptied as may be considered necessary.

(3) SACCULATION OF THE UTERUS

Sacculation is said to result when one wall of the gravid uterus remains in the pelvic cavity while the other grows into the abdomen.

Two distinct varieties may be noted—anterior sacculation and posterior sacculation.

In the anterior type the cervix is directed towards the sacral promontory or the hollow of the sacrum and lies posteriorly while in front of it and in close relationship to the bladder a saccule of the uterus is formed by the non-expanded anterior uterine wall. The fundus has become attached to the anterior abdominal wall low down and only the posterior wall can expand.

In posterior sacculation on the other hand the cervix is directed towards the symphysis pubis and occasionally may lie above it. A saccule is formed by the non-expanded posterior wall of the uterus and fills the hollow of the sacrum while the greater part of the growing foetus is accommodated by increased growth of the anterior wall of the uterus. Posterior sacculation is the type that occurs in cases of retroverted gravid uterus.

likely to recur as the uterus is by then too large. Once the uterus has become an abdominal organ the pessary should be removed.

Occasionally when the uterus cannot be manipulated into position it is wise to leave the case alone but the patient should be watched carefully to see that neither bladder nor rectum become distended. In some of these cases abortion may occur but in the majority the uterus rights itself and the organ gradually rises out of the pelvis as the pregnancy proceeds.

(b) *After Incarceration* When incarceration has occurred the same methods of treatment outlined above may be tried as a preliminary to adopting one of the methods to be described. It is desirable to keep the bladder empty for twenty four to forty-eight hours and to treat the condition of cystitis if present. In some cases difficulty may be experienced in emptying the bladder due to the elongation of the urethra and its constriction. It may be necessary to perform a suprapubic cystotomy and drain the bladder if a catheter cannot be passed. In cases of severe cystitis where the bladder requires to be frequently emptied or washed out it is better to leave a catheter *in situ*. After this preliminary treatment efforts at manual reposition should be made. If they are not successful there are two alternatives —

(1) Induction of abortion

(2) Reposition of the uterus by the abdominal route

(1) *Induction of Abortion* This is occasionally necessary when the possibilities of survival of the ovum are remote and signs and symptoms of a severe bladder infection are present or the general condition of the patient does not warrant an abdominal operation. In cases where induction of abortion is decided upon two methods may be adopted —

(1) Rupture of the membranes so allowing the liquor amni to drain off

(2) Dilatation of the cervix

Considerable difficulty may be experienced in dilatation of the cervix owing to its position. The difficulty in completely evacuating the uterus is not inconsiderable in such cases.

As an alternative it may perhaps be much more satisfactory to perform a vaginal hysterotomy which in most of these cases is not difficult. An incision is made into the uterus posteriorly, the uterine cavity opened and evacuated after which it is stitched up.

(2) *Replacement of the Gravid Uterus by the Abdominal Route* This operation is more frequently resorted to now but it must be emphasised that it should be done at an earlier stage and not where the impaction has led to severe inflammation and sloughing of the bladder walls. This operation should be done only when

the bladder has not gone to the stage of gangrene and when there are no symptoms of acute peritonitis. After separation of any adhesions the uterus is replaced and suspended in an anteverted position. After this treatment the patient is given repeated doses of morphia or some other uterine sedative for the first twenty four hours to reduce the possibility of abortion and during the operation itself manipulative measures must be reduced to a minimum and carried out as gently as possible.

A complication of grave significance is the inflammation of the bladder already referred to. It is important to treat this condition during the early stages. Careful emptying of the bladder is necessary. Occasionally gangrene of the bladder with the escape of foul urine and pus and shreds of denuded membrane may occur. When a diagnosis of this condition is made free drainage is absolutely essential. This can be done by the vaginal route by opening through the anterior fornix into the base of the bladder. Urinary antiseptics such as hexamine in one form or other may be administered orally or intravenously.

Occasionally it may be necessary to open the bladder from above. In cases where severe bladder symptoms are present it is not desirable to attempt induction of abortion or undertake any operative methods for the replacement of the gravid uterus till the infection of the bladder has first been brought under control. Once this has been achieved the uterus may be replaced or emptied as may be considered necessary.

(3) SACCULATION OF THE UTERUS

Sacculation is said to result when one wall of the gravid uterus remains in the pelvic cavity while the other grows into the abdomen.

Two distinct varieties may be noted—anterior sacculation and posterior sacculation.

In the anterior type the cervix is directed towards the sacral promontory or the hollow of the sacrum and lies posteriorly while in front of it and in close relationship to the bladder a saccule of the uterus is formed by the non expanded anterior uterine wall. The fundus has become attached to the anterior abdominal wall low down and only the posterior wall can expand.

In posterior sacculation on the other hand the cervix is directed towards the symphysis pubis and occasionally may lie above it. A saccule is formed by the non expanded posterior wall of the uterus and fills the hollow of the sacrum while the greater part of the growing fœtus is accommodated by increased growth of the anterior wall of the uterus. Posterior sacculation is the type that occurs in cases of retroverted gravid uterus.

Causes. Sacculations of the uterus generally result from displacements of the gravid uterus

In retrodisplacements of the gravid uterus posterior sacculation of the uterus occurs, while anterior sacculation may result in conditions associated with anterior displacements, or in cases of ventrofixation when this operation has not been properly performed

The conditions favouring sacculation are fundal adhesions, presence of fibroid tumours or occasionally a prominent sacral promontory overhanging and preventing the escape of the fundus of the gravid uterus into the abdomen

Signs and Symptoms In the early stages the signs and symptoms are referable to retrodisplacement of the uterus, such as difficulty in micturition, or retention of urine Sacculation being, as already stated, one of the possible terminations in a retrodisplaced gravid uterus, it is obvious that many of the signs and symptoms of the latter condition are present When, however, sacculation has resulted symptoms gradually abate, and not till the patient actually goes into labour may the condition be recognised When labour starts the contractions of the uterus do not result in dilatation of the cervix The extreme displacement of the cervical os prevents its being taken up in the first stage of labour, and the forces of uterine contractions are ineffectual as they are directed towards the cupola of the sacculum and not towards the cervical canal Labour is thus prolonged, and in extreme cases the condition may result in secondary uterine inertia or uterine rupture Fortunately, in the majority of cases, such serious terminations do not result, the cervix is taken up to some extent and when the condition is recognised it is usually possible to pull the cervix into position and dilate it manually

Treatment If delay in labour occurs, attempts should be made to draw the cervix down and gradually dilate it Once dilatation has been rendered possible treatment becomes simple The delivery may be effected either by the application of forceps or in some cases where the head has not descended by internal podalic version and extraction Tears of the cervix are sometimes inevitable In some cases it may be necessary to make incisions into the cervix to aid dilatation.

If dilatation of the cervix be found impossible either by manual methods of dilatation or by incisions combined if necessary, with manual dilatation, the question of a vaginal or abdominal Caesarean section must be considered

When the sacculum is very definite and presses low into the vaginal cavity, the vaginal mode of delivery by hysterotomy may be preferable The bladder or the rectum may have to be separated and an incision made into the sacculum in the median line, extending

up from the cervical canal. After opening into the lower uterine segment the delivery is completed. Where, however, conditions are not favourable for vaginal hysterotomy an abdominal Cæsarean section can be performed.

2 Anterior (Forward) Displacements of the Gravid Uterus

Two varieties of anterior displacements have been noted (1) anteversion and (2) antelexion. The normal attitude of the non gravid uterus is one of slight anteversion and antelexion. It is only in those cases where this position becomes exaggerated that it is said to be pathological. Anteversion is much more common than antelexion of the gravid uterus.

Causes (1) Weak abdominal parietes favouring the forward displacement of the gravid uterus, producing the condition known as a pendulous abdomen. In such cases the anteversion may be so extreme that occasionally the fundus lies at a lower level than the lower pole of the uterus. Multiparæ suffer much more commonly from this affection than primiparæ. With the increase in the number of pregnancies the abdominal wall becomes very much weakened and flaccid and the muscles atrophy so that there is a tendency for anteversion to occur. Divarication of the recti may also take place in these cases increasing the forward displacement.

In the tropics the condition is due to improper nutrition particularly lack of vitamins producing an extreme degree of thinness of the abdominal wall after only one or two pregnancies.

(2) The displacement may often be met with in contractions of the pelvis, particularly in those where there is associated kyphosis lordosis or spondylolisthesis.

(3) In cases of twins large fetuses tumours complicating pregnancy and hydramnios the condition may occur.

Signs and Symptoms During pregnancy an abnormal feeling of heaviness and general abdominal discomfort will be complained of in the majority of cases. Pressure and pulling on the bladder may give rise to frequency of micturition. Dragging pains in the loins and difficulty in locomotion may cause a sedentary habit of life which in turn leads to other disorders. Sometimes the pressure may result in the skin of the lower abdomen becoming eczematous and varices and œdema of the vulva may also occur.

During labour severe dystocia may arise. The forward displacement results in the cervix being pushed backwards towards the hollow of the sacrum, occasionally it may even be above the level of the promontory. In such cases the force of the uterine contractions is directed posteriorly and not along the axis of the birth canal. Dilatation is delayed the presenting part is displaced

posteriorly and engagement of the head in the brim of the pelvis does not occur. Malpresentations are therefore frequent. Owing to premature rupture of the membranes prolapse of the cord may result.

Prognosis—Maternal The increased risks of complication during pregnancy, and the difficulties that may occur during the course of labour render the prognosis unfavourable for the mother. Delay in dilatation of the cervix, malpresentations and malpositions, and the necessity for interference in a large number of cases render the prognosis worse. In neglected cases prolonged labour may result in rupture of the uterus. The chances of infection are increased owing to the delay and the need for operative interference to terminate labour.

Fatal The fetal risks are materially increased. Malpresentations and malpositions, prolapse of the cord, prolongation of the stages of labour and the increased pressure of the uterine contractions after the fluid has drained away all render the prognosis graver for the child. Fetal mortality is therefore very high.

Treatment In the majority of cases antenatal care will greatly diminish the risks incidental to this condition. The woman should be fitted with an abdominal binder or corset suited to the period of pregnancy. It is not desirable that she should indulge in any heavy exercises or exert herself in her household duties. During labour the woman should be kept in the recumbent dorsal posture and a tight abdominal binder applied so that the uterus may be braced back. Malpresentations if present should be corrected. Once the head engages in the brim of the pelvis labour pains usually proceed in a more orderly manner.

There may be delay however in the second stage of labour owing to the weakness of the accessory muscles of labour and help may be necessary. The application of forceps or in some cases an internal podalic version followed by extraction may be required.

Where however the anteversion is due to a contraction of the brim of the pelvis which has interfered with the engagement of the head the treatment should be directed to the causative factor viz the contraction of the pelvis. The mode of delivery will depend upon the variety and the extent of this. Usually it is safer to perform a Cæarean section as the condition is not likely to result without there being a fairly severe degree of contraction at the brim.

During the puerperium occasionally ante flexion prevents the escape of lochia and the condition of lochiometra results. In such cases massaging the uterus, injections of pituitary extract and a tight abdominal binder with a pad applied just above the pubes are sufficient to promote proper involution of the uterus.

Ventrofixation and Ventrosuspension A considerable literature has gathered around these operations and the serious dystocia that may follow them if the woman becomes pregnant. It has been emphasised that these operations are attended with such grave risks that they should never be done in the child bearing period. Whitridge Williams goes so far as to say that During the child bearing period fixation should never be done unless it is preceded by some procedure which will effect a permanent sterilisation while suspension should be practised only when urgently indicated. DeLee opines The frequency of abortion difficult labour postpartum hemorrhage and the necessity for capital operations to overcome obstruction should forbid the practice of ventral fixation in the child bearing woman an opinion also held by Craggon and Pollock. Curtis is of the same opinion. 'Ventrofixation on the other hand says the author of the article should never be done without sterilisation or unless the woman is past the menopause. In this operation sewing the fundus of the uterus into the lower angle of the fascia of the abdominal wound prevents rising of the uterus into the abdomen. It would produce abortion in some cases or at least dangerous sacculation of the posterior wall in those cases that go on to term. Jellett is of the same opinion and commends it only in women past the child bearing age.

In refreshing contrast to these extreme opinions may be mentioned the observations of Berkeley and Bonney who state

The effect of ventrofixation of the uterus on pregnancy and labour entirely depends upon the situation and the extent of the artificial attachment. Attachment of the uterus to the anterior abdominal wall if performed in the most approved method that is by suturing a limited area of the anterior uterine wall to the parietal peritoneum (ventrosuspension) is not found to interfere materially either with pregnancy or labour. When however a large area of the uterine wall has been attached to the parietal peritoneum and fascia difficulties arise in direct proportion to the firmness of the attachment. This is especially so when the uterus has been fixed directly to the abdominal aponeurosis through a gap intentionally created in the parietal peritoneum (ventrofixation).

We support the last opinion from considerable experience having performed the operation in several hundreds of cases and having noted the effects of pregnancy and labour after such an operative technique. We would emphasise with Berkeley and Bonney that in the main the technique of the operation is important and much depends upon it. If the uterus is fixed on its anterior aspect in the median line equidistant between the two cornual ends and just below the fundus over a small area by a couple of

sutures to the anterior parietal peritoneum and the recti no difficulty of any sort is experienced. A short stout ligament forms which undergoes changes along with the uterine musculature during pregnancy and puerperium, hypertrophying in the former condition and involuting in the puerperium.

The situation at which the uterus is fixed to the abdominal wall is also of importance. We do not recommend the low fixation but prefer the mid or the high fixation wherein the uterus is pulled up and fixed to the abdominal wall at a point near the junction of the upper two-thirds and the lower third of the line joining the umbilicus and the midpoint of the symphysis pubis.

In cases where displacements are complicated with prolapse the fixation may be done at a still higher point almost midway between the umbilicus and the symphysis pubis. We have not experienced any difficulty after the operation and dystocia during labour has not been in excess of what might have been expected in the absence of such an operation. Occasionally help with forceps has been necessary but usually for reasons unconnected with the operation of fixation.

We would however maintain that if the operation is not performed with the proper technique abnormalities do arise such as sacculation of the uterus malpresentations or difficulty with the emptying of the bladder.

The position is entirely different with the operation of vaginal fixation. It should never be done in the child bearing period as it does lead to grave dystocia in labour even if it does not interfere with the course of pregnancy by causing abortion or premature labour. In such cases if the pregnancy progresses to term a Cesarean section may be the operation of choice and we prefer the abdominal route. It is necessary to provide for drainage of the uterus whatever may be the route by which the Cesarean section is done as in some cases flexion of the uterus results in the greater part of the body being at a lower level than the cervix.

cervix may recede within the vaginal canal. In some cases the cervix may protrude outside and may become infected and ulcerated by the irritation from surrounding parts.

Prolapse of the gravid uterus is one of the most serious complications because of the risks of abortion, difficulty in delivery, lacerations, sepsis and the tendency for inversion of the uterus. The prolapse may be due to previous lacerations and weakening of the uterine ligaments or to pressure from above caused by tumours, ascites, etc.

In the early months care should be taken to see that the cervix is cleaned properly, touched with antiseptics (alcoholic picric

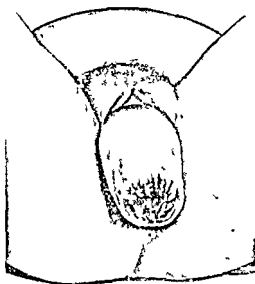


FIG. 112.—Prolapse of the gravid uterus

Note the ulceration of the external os

solution), and kept in position by means of a clean sterile swab placed in the vaginal canal and changed daily, or preferably by a pessary inserted for a few weeks. After the uterus enlarges sufficiently to sit on the pelvic brim, the tendency for prolapse diminishes. No operation is desirable at this stage for the cure of the prolapse as abortion will invariably result.

During the later months, if prolapse is present the perineum and vagina should be cleaned, the prolapsed cervix painted with an antiseptic, replaced, and the patient put to bed with the foot of the bed raised and kept in the recumbent posture for as long a time, even weeks, as is necessary to prevent a recurrence.

At the time of labour prolapse may give rise to —

(1) Non-dilatation of the cervix, there is difficulty in the cervix being taken up

(2) Tendency for prolapse is increased with each pain. The prolapsed cervix and a portion of the lower uterine segment may project outside the introitus vaginae. This increases the risks of sepsis and may render artificial assistance necessary. Owing to lack of full dilatation lacerations of the cervix may be inevitable.

Treatment Depends upon the degree of prolapse, condition of the cervix, presentation, period of pregnancy and the stage of labour at which the patient is seen.

In the milder forms manual dilatation of the cervix and careful extraction may be all that is necessary. In other cases, after taking antiseptic precautions, incisions of the cervix or vaginal hysterotomy may be indicated. In some rare cases lower segment Cæsarean section may be done.

During the third stage of labour there is a greater tendency for postpartum hæmorrhage. The fundus is likely to become displaced into the hollow of the sacrum, and with retroflexion of the puerperal uterus it is difficult to control the fundus and re-establish the tone of the uterus. In such cases we have raised the uterus into the abdomen by plugging sterile artificial sponges into the posterior vaginal fornix. The uterus can then be better controlled and stimulated by massaging.

During the puerperium the condition of the cervix should be carefully noted and, if necessary, the cervix touched with suitable antiseptics from time to time, so as to prevent any spread of infection.

Hypertrophic Elongation of the Cervix

Closely associated with prolapse is the condition known as hypertrophic elongation of the cervix. Usually, in such a condition pregnancy does not occur, but when it does, the hypertrophic elongation may persist and simulate prolapse.

A careful bimanual examination will, however, reveal the fact that the body of the uterus is in its normal position and that the elongation is purely cervical. It is desirable in such cases to replace the cervix within the vaginal canal if it has not already receded with the growth of the uterus upwards into the abdominal cavity. The same precautions should be taken to keep the cervix clean by painting with antiseptics and by using sterile sponges frequently.

When the patient goes into labour with hypertrophic elongation of the cervix difficulties may arise in the dilatation of the cervical canal. The cervix is generally taken up, but occasionally the first stage of labour is prolonged. Artificial dilatation may be required,

deeply congested, and in some cases bleeding may occur from some of the congested vessels. If neglected the congestion and the consequent inflammation may lead to the onset of symptoms of peritonism, with paresis of the intestines, and the condition of the patient becomes progressively worse.

Treatment This consists in immediate laparotomy. In some cases it may be possible to correct the displacement, and if the pregnancy has not been affected to leave the uterus *in situ*, removing if possible any factors responsible for the condition. More usually it is necessary to perform an abdominal hysterotomy and evacuate the uterus. If the condition of the uterine wall however is such that sloughing is likely to occur on account of severe inflammation hysterectomy is advisable, or if the tubes and other adnexa are affected and are likely to undergo sloughing it may be necessary to remove them as well with the uterus. Where the uterus is the seat of fibroids it is wise to do a hysterectomy, rather than attempt to enucleate the fibroids after hysterotomy in a uterus that is congested and the seat of unhealthy muscular fibres.

CHAPTER XXXV

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

3 Tumours of the Uterus Adnexa and Neighbouring Structures complicating Pregnancy, Labour and the Puerperium

SEVERAL varieties of tumours may complicate pregnancy and labour. They may be classified under the following heads —

Tumours of the Uterine Body

Fibroids carcinoma of the body of the uterus

Tumours of the Uterine Cervix

Fibroids carcinoma of the cervix

Tumours of the Vagina

Cysts of the vagina, carcinoma of the vagina

Tumours of the Vulvar Outlet and Perineum

Cysts of Bartholin's gland elephantoid growth of the vulvar outlet infective granuloma of the vulva and carcinoma

Tumours of the Adnexa

Ovary Solid tumours of the ovary cystic tumours unilocular cysts multilocular cysts, dermoid cysts

Parovarium Parovarian cysts

Tumours of the surrounding Organs

Bladder Neoplasms of the bladder, stone in the bladder

Tumours of the surrounding Organs (continued)

Rectum—New Growths Adenocarcinoma of the rectum, benign tumours of the rectum; "syphilitic growth" of the rectum

Pelvis, Bony Ivory exostosis

Displaced Viscera Wandering kidney, movable spleen and omental masses may occasionally be displaced into the pelvis and act as pelvic tumours as far as pregnancy and labour are concerned

The most important and common of the tumours complicating pregnancy are however, fibroids, ovarian cysts and carcinoma of the cervix, and these will be dealt with in detail

Fibroid Tumours

Fibroid tumours complicating pregnancy may be of the three varieties—submucous, interstitial or subperitoneal

Fibroids of the uterus tend to diminish the chances of pregnancy but when pregnancy does occur important changes take place both in the fibroids as well as in the associated pregnancy

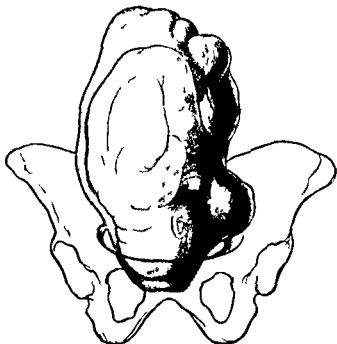
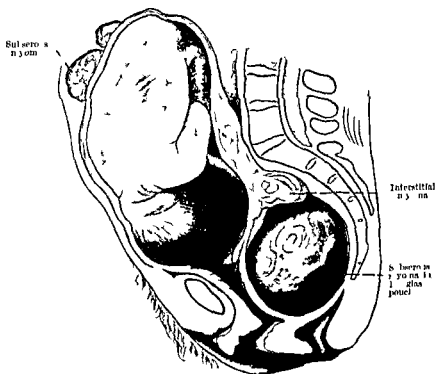


FIG. 143.—Multiple foetal completion pregnancy (Burns)



Retroperitoneal fibroids may cause symptoms at an earlier stage and give rise to more complications than other types and tend to cause displacement of the gravid uterus. The interstitial and submucous ones favour abortion. Subperitoneal fibroids generally do not have any effect on the course of pregnancy unless they are of large size when pressure symptoms may manifest themselves.

Fibroids tend to the formation of placenta prævia.

In the later months of pregnancy the pressure symptoms may be exaggerated and there is a distinct tendency for the onset of premature labour, which is also favoured by the degenerative changes that fibroids may undergo during pregnancy.

EFFECTS OF FIBROIDS ON LABOUR AND THE PUERPERIUM

Apart from the complications already mentioned as occurring during the course of pregnancy, fibroids may give rise to serious complications during labour and the puerperium.

During Labour—First Stage Besides the likelihood of premature labour occurring there is an increased tendency for delay to develop in the first stage due to the lack of efficient uterine contractions because of the fibroids. Malpresentations and malpositions are much more frequent because with cervical and retroperitoneal fibroids and fibroids low down in the lower uterine segment the presenting part is prevented from engaging at the brim of the pelvis. These varieties also tend to obstruct labour because of their position. Premature rupture of the membranes and prolapse of the cord are likely to occur.

uterus and increase the chances of sepsis because of the inflammatory changes that they may themselves undergo. Occasionally during the process of involution interstitial fibroid may become submucous and if by any chance there is uterine infection septic changes occur. There is increased tendency for inversion of the uterus to occur either during the third stage of labour or during the puerperium particularly in cases where the fibroids are situated at the fundus or in the upper uterine segment.

Diagnosis The frequency with which the presence of fibroids is noted only after confinement either in the third stage or in the puerperium serves to demonstrate the difficulty of diagnosing them during pregnancy. Fortunately in the majority of cases fibroids do not give rise to any difficulty in labour and complications rarely occur. Often it is only in the puerperium that they may have to be watched with care for possible degenerative changes.

Subperitoneal fibroids, specially when pedunculated will be felt as hard nodular growths projecting from the uterus. Fibroids on the posterior wall of the uterus are less likely to be recognised. Interstitial fibroids may be mistaken for a fetal part generally for an elbow or knee when of small size and for a head or breech when larger. The mobility of a fetal part within the uterus as compared to the immobility of the fibroid apart from the uterine wall helps to differentiate the two conditions. Where fibroids obstruct labour a careful vaginal examination may reveal the presence of the hard growth. It may sometimes be necessary to examine the patient thoroughly under a general anæsthetic before recognising the condition. Not infrequently a large interstitial fibroid noted after delivery may simulate a second foetus and in some cases an intra uterine examination may be needed to settle the diagnosis.

Sometimes fibroids may be mistaken for ovarian tumours, pyosalpinx, omental adhesions or parametric swellings. A rarer form of mistake is to confuse one half of the uterus for a fibroid in a *uterus didelphys* or *bicornis*. Even after the delivery of the child we have seen cases where a large interstitial fibroid has been mistaken for the second child of a twin pregnancy and fruitless attempts at version and extraction made. Where hard tumours are present on the surface of the uterine wall as in the condition of subperitoneal fibroids the diagnosis may not be difficult unless there is a fat abdominal wall. Retroperitoneal and cervical fibroids can be recognised only by vaginal or bimanual examination and in cases where there are symptoms suggestive of undue pressure in the pelvis or the presenting part remains high and the pelvis is normal this should always be done.

The presence of fibroid may give rise to considerable difficulty in diagnosis of pregnancy in the early months. Cases are recorded

where gynecologists of experience have opened the abdomen on the supposition that they were dealing with a fibroid uterus but found that the uterine enlargement was due to pregnancy. Even after opening the abdomen the general configuration of the uterus appearance and relative softness may occasionally cause doubt as to whether one is dealing with a pregnant uterus or an interstitial fibroid which has enlarged the uterus uniformly. The points of differential diagnosis between fibroids and pregnancy have already been dealt with in the chapter on the diagnosis of pregnancy. The importance of the Aschheim Zondek test may here be reiterated as well as the possibility of exploration with a needle in cases of exploratory laparotomy as a final and conclusive test of the presence or otherwise of pregnancy in association with fibroids.

Prognosis The prognosis when fibroids complicate pregnancy depends on the following points —

(1) *The Variety of Fibroids* Interstitial and submucous fibroids are likely to give rise to more complications and render the prognosis worse than subperitoneal ones.

(2) *Size and Number of the Fibroids* The larger the fibroid the greater is the tendency for pressure symptoms and for anomalies in the course of labour particularly when the fibroid is situated in the lower uterine segment or cervix. The greater the number of fibroids the greater is the chance of uterine inertia and postpartum hæmorrhage.

(3) *The Situation of the Fibroid* Of even greater importance than the size of the fibroid is the situation thereof. Retroperitoneal fibroids and cervical fibroids are likely to give rise to obstruction during labour and they may undergo degenerative changes during the puerperium.

(4) *Degenerative Changes* Thus perhaps is one of the most serious of complications. Red degeneration inflammation and sloughing of fibroids may lead to serious consequences in pregnancy or the puerperium and the prognosis is therefore much worse when such degenerative changes take place.

(5) *The Nature of the Treatment adopted* The facilities available for the proper treatment of fibroids complicating pregnancy or labour should be taken into consideration. If the patient can be treated in a well equipped hospital and Cæsarean section with or without hysterectomy is performed at an early stage the prognosis may not be unfavourable but in neglected cases where the patient is referred to a hospital after several hours of obstructed labour the cause of obstruction being a fibroid situated at the lower uterine segment or in Douglas pouch the prognosis is definitely worse no matter what method of treatment is then adopted.

Fœtal Prognosis When fibroids are present there is a tendency for abortion or premature labour. In other cases the stage at which

the patient comes in for treatment may necessitate destructive operations on the child before delivery can be effected. On the whole it may be said that the presence of fibroids renders the foetal prognosis worse owing to the number of complications that are likely to arise during pregnancy and in labour.

Treatment. Certain general principles may be laid down in regard to the treatment of fibroids complicating pregnancy —

(1) As a rule it is wise not to interfere with the fibroids nor attempt to remove them unless a definite indication is present. It is a matter of common experience that in the majority of women with fibroids complicating pregnancy no discomfort or trouble of any kind arises; there is no interference with the process of labour and the puerperium is uneventful. An attitude of watchful expectancy is most desirable in such cases.

(2) If for any reasons such as the possibilities of interference with labour it is considered necessary to operate it is best to operate at as late a stage in pregnancy as possible or perhaps early in labour with a view to give the best chance possible to the foetus.

(3) Under certain conditions it is inevitable that operation should be resorted to and in such cases hysterotomy will be found necessary irrespective of the period of gestation.

(4) Wherever possible it is desirable when operative procedures are adopted to deal with the fibroids at the same time either by enucleating them or by performing hysterectomy. Such radical methods of treatment should of course only be adopted when the condition of the patient permits of their being performed with safety.

We shall deal with the treatment in the various stages of pregnancy, labour and puerperium.

(A) *In the Early Weeks of Pregnancy.* Where no symptoms exist there is no necessity to interfere; the patient however should be carefully watched throughout pregnancy. The possibility of abortion occurring in the early weeks should be kept in mind. The tendency for retroversion of the gravid uterus should be remembered and measures adopted to correct such displacement should it occur.

(B) *In the later weeks of pregnancy* interference because of fibromyomata may become necessary owing to any one of the following causes —

(1) Degenerative changes of fibroids particularly necrobiosis.

(2) Severe hæmorrhage. This may occur in the submucous and occasionally in the interstitial variety which tends to become submucous.

(3) Serious pressure symptom. Pressure symptoms may be due either to the large size or situation of the tumour. When the

fibroid is of large size it causes undue distension of the abdomen and thereby pressure on the abdominal viscera and neighbouring structures. Fibroids even though small in size if they remain within the pelvis may cause pressure symptoms.

(4) Torsion. Occasionally torsion may actually involve the gravid uterus and give rise to serious symptoms characteristic of an acute abdomen.

When such symptoms arise a laparotomy is essential. The further treatment will depend upon the size and situation of the tumour. The following are the methods of treatment that may be adopted —

- (i) Enucleation of the fibroid leaving the pregnancy to continue
- (ii) Cæsarean section and enucleation of the fibromyomata
- (iii) Cæsarean hysterectomy subtotal or total

A method of treatment that may be adopted with fibromyomata in the non gravid condition namely treatment with deep X ray therapy is not to be considered in cases where pregnancy co-exists. The risks of irradiation on the foetus are so pronounced that such a remedy should never be attempted.

(C) *Fibromyomata complicating Labour*. Subperitoneal fibroids may not interfere with the course of labour and in the majority of cases where the fibroids are small labour terminates spontaneously. In some cases however the tumour may be small enough not to interfere with labour but may be bruised and become septic during the puerperium. Occasionally the tumour may be the direct cause of obstruction or of hæmorrhage. It must be remembered however that most fibroids develop in the body of the uterus which during labour forms the upper uterine segment. This by virtue of the retraction which occurs tends to make fibroids assume a higher level as labour advances. In this way fibroids that look as if they would cause obstruction when seen antenatally during labour are carried up out of the region of the pelvic brim and so obstruction is averted. Obstruction however may occur in various ways. A cervical myoma even of small size because it cannot be carried up out of the pelvis may cause obstruction to the passage of the child. A submucous fibroid may project into the internal os and so interfere with the descent of the presenting part. retroperitoneal fibroids and fibroids situated low in the uterine wall tend to remain pelvic and therefore are liable to cause serious obstruction to the course of delivery.

Other complications that may arise are —

- (1) Hæmorrhage. (a) This may be due to the tearing of adhesions omental or otherwise during the contractions of the uterus. (b) The increased risk of postpartum hæmorrhage is due

to insufficient retraction consequent on the presence of fibroids, or to an adherent placenta

(2) Inversion of the uterus

Treatment In cases where fibroids are situated above the pelvic brim and are not therefore likely to obstruct the passage of the foetus, labour is allowed to proceed under careful supervision. If small fibroids are situated in the pelvis it may occasionally be possible to push them above the pelvic brim so as not to cause any obstruction, or in some cases they become displaced above the brim by the natural process of labour when the cervix is taken up. In no case where a fibroid tumour of any size persists in the pelvis is it desirable to allow the presenting part to descend or to extract it with force. The dangers associated with such forcible extraction are —

(1) Injury to the presenting part such as intracranial hæmorrhage

(2) Serious compression of the fibroid may later result in necrosis or infection during the puerperium

(3) Pressure effects upon the neighbouring organs, especially the rectum and the bladder, may cause pressure necrosis and result in the formation of a rectovaginal or vesicovaginal fistula at a later date

(4) Occasionally the engorged and dilated veins over the tumour may be injured and fatal hæmorrhage into the peritoneal cavity occur

In general therefore, labour obstructed by myomata is best treated by abdominal operation, unless the myoma can be safely removed through the vaginal route. Pedunculated cervical fibroids may be removed by the vaginal route and labour allowed to progress, but in other cases the abdominal route offers the only safe method of treatment in the interests of the mother and the child

When a case is dealt with by the abdominal route, four methods of termination may be adopted —

(1) *Myomectomy*, followed by the extraction of the foetus *per vaginam*. We do not advocate this method, as we consider that very little advantage is gained and the chances of getting a live child are rendered more difficult in addition to the tendency for postpartum hæmorrhage to occur

(2) *Cæsarean Section followed by Myomectomy*. This is the ideal method of treatment in the majority of cases, and should be adopted wherever possible. After the foetus has been delivered through the abdominal route, if the number of fibroids is not excessive and they are so situated that they can be easily removed, myomectomy should be performed. A danger, however, is an increased tendency for the uterus to bleed, and it is not always easy to control the hæmorrhage after myomectomy in a full term uterus. Moreover,

in such cases, unless the patient is free from any chance of infection, the additional risk of sepsis must also be borne in mind

(3) *Cæsarean Section followed by Hysterectomy, Total or Subtotal* This is the method generally preferred in cases where the uterus is too extensively diseased to be of much service later. Where the fibroids are multiple and the woman is a multipara, and if there is any suspicion of infection, the proper line of treatment is to perform Cæsarean hysterectomy. Under such circumstances the child is first delivered and the uterine incision sutured by a few interrupted stitches and then hysterectomy performed. The choice between supravaginal and total hysterectomy depends largely upon the condition of the patient, the position of the tumour and the possibilities of septic infection. Total hysterectomy has a slightly higher maternal mortality and should not therefore be lightly undertaken in those cases where the condition of the patient does not warrant it. But if the tumours are situated low, and particularly if cervical fibroids are present, or if there are definite signs of septic infection, total hysterectomy is the better choice.

(4) *Conservative Cæsarean Section* This is probably the least desirable method of treatment, for it does not deal with the fibroids and not only makes a subsequent operation essential, but leaves room for the possibility of degenerative changes or other complications developing in the puerperium.

Another indication for abdominal operation, apart from obstruction to labour, is intraperitoneal hæmorrhage, which may occur during the course of labour due to the tearing of omental adhesions by the force of the uterine contractions. When any sort of intraperitoneal bleeding is present it is always wise to perform a laparotomy and deal with the condition. When a laparotomy is done this must be followed by the delivery of the child through the abdominal route and the treatment of the associated condition of fibroids.

Test Labour The question of test labour for fibroids complicating pregnancy sometimes arises. Whenever test labour is adopted, an attitude of watchful expectancy throughout the course of labour is very essential, as at any stage it may be necessary to resort to one of the operative methods of treatment outlined above. Test labour may be undertaken in the following circumstances —

- (1) If the fibroids are entirely subperitoneal
- (2) If they are interstitial and situated in the upper uterine segment
- (3) If they are retroperitoneal, small in size and mobile
- (4) In cases of premature labour, provided the obstruction is not pronounced

The contraindications to a test labour are —

- (1) Large retroperitoneal fibroids
- (2) Fibroids impacted in the pelvic cavity
- (3) Fibroids which show evidence of degenerative changes
- (4) Large cervical fibroids, sessile or pedunculated Unless it is possible to remove them by the vaginal route before allowing test labour to occur

(5) If there is definite evidence of disease of the adnexa, such as ovarian cysts or inflammatory conditions of the tubes

(D) *Fibromyomata complicating the Puerperium* Although labour may have terminated through the natural passages, troubles may arise during the puerperium because of the presence of fibromyomata. This generally occurs in the submucous and interstitial varieties, although even the subserous ones may occasionally be injured during labour or undergo torsion of the pedicle and thus lead to congestion or even occasionally to torsion of the whole puerperal uterus. The degenerative changes that may occur are infection, necrosis and necrobiosis. Occasionally an interstitial tumour may tend to become submucous and give rise to hæmorrhage, and a submucous one may become polypoid and predispose to a degree of inversion.

So far as the uterus is concerned the presence of fibroids may lead to subinvolution, increased risks of septic infection and a tendency for secondary postpartum hæmorrhage and displacements of the uterus. Submucous fibroids situated low down may occlude the cervical canal and favour the development of lochiometra,

A word of caution may be given here with regard to the treatment of submucous fibroids. It is necessary to be quite sure about the diagnosis of this condition as not infrequently inversion of the uterus has been mistaken for a small submucous fibroid situated near the fundus. Where both inversion and a submucous fibroid occur together steps should be taken to reduce the inversion after removal of the tumour. Displacements of the uterus should also be corrected. Where degeneration occurs in a large fibroid particularly an interstitial fibroid it is best to perform hysterectomy.

If secondary hæmorrhage should take place it may have to be controlled by tamponage of the vagina or in some cases it may be wiser to operate and remove the uterus.

In all cases where fibroids have been noted during the puerperium the patient should be cautioned about them examined eight to twelve weeks later and suitable treatment adopted. Occasionally the fibroids share in the involution of the uterus and atrophy but in the majority of cases especially with big fibroids the patient should be advised to undergo treatment at a later stage.

CHAPTER XXXVI

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

Ovarian Tumours complicating Pregnancy and Labour

Tumours of the ovary complicating pregnancy may be either cystic or solid.

Among the *cystic tumours* are —

Simple serous cysts	Multilocular cysts
Dermoid cysts	Papilliferous cysts

The *solid tumours* are —

Fibromata	Adenomata
Malignant tumours either carcinomata or sarcomata	

CYSTIC TUMOURS

The commoner varieties met with are the simple serous or multilocular cysts. Next in frequency come the dermoids. Solid tumours of the ovary are comparatively rare occurring perhaps in less than 5 per cent. of the cases.

Effect of Pregnancy on Ovarian Cysts. Pregnancy does not appear to have any particular effect upon the growth of ovarian cysts in contradistinction to its well known effect on fibromata.

The contraindications to a test labour are —

- (1) Large retroperitoneal fibroids
- (2) Fibroids impacted in the pelvic cavity
- (3) Fibroids which show evidence of degenerative changes
- (4) Large cervical fibroids, sessile or pedunculated. Unless it is possible to remove them by the vaginal route before allowing test labour to occur

(5) If there is definite evidence of disease of the adnexa, such as ovarian cysts or inflammatory conditions of the tubes

(D) *Fibromyomata complicating the Puerperium* Although labour may have terminated through the natural passages, troubles may arise during the puerperium because of the presence of fibromyomata. This generally occurs in the submucous and interstitial varieties, although even the subserous ones may occasionally be injured during labour, or undergo torsion of the pedicle and thus lead to congestion or even occasionally to torsion of the whole puerperal uterus. The degenerative changes that may occur are infection, necrosis and necrobiosis. Occasionally an interstitial tumour may tend to become submucous and give rise to hæmorrhage, and a submucous one may become polypoid and predispose to a degree of inversion.

So far as the uterus is concerned the presence of fibroids may lead to subinvolution, increased risks of septic infection, and a tendency for secondary postpartum hæmorrhage and displacements of the uterus. Submucous fibroids situated low down may occlude the cervical canal and favour the development of lochiometra leading later to pyometra.

Ecbolics are contraindicated in the puerperium in such conditions as they favour the extrusion of fibroids of the interstitial variety into the uterine cavity.

Treatment When myomata are recognised during the puerperium or have been noted during pregnancy or labour, a careful watch must be kept over the patient for the appearance of any of the complications noted above. The symptoms to be watched for are pain and tenderness over the uterus, fever, hæmorrhage and an offensive lochia or suppression of lochia. If symptoms of torsion manifest themselves it is a clear indication for interference.

Treatment depends upon the variety of the tumour. Submucous tumours should be removed by the vaginal route, if pedunculated the pedicle should be twisted and then cut through with a pair of scissors. In cases of interstitial fibroids or subperitoneal fibroids enucleation must be done through the abdominal route. If enucleation is impossible or there is evidence of sepsis or if the uterus has rotated with the tumour and the uterine musculature is diseased the question of the removal of the uterus should be considered.

A word of caution may be given here with regard to the treatment of submucous fibroids. It is necessary to be quite sure about the diagnosis of this condition, as not infrequently inversion of the uterus has been mistaken for a small submucous fibroid situated near the fundus. Where both inversion and a submucous fibroid occur together steps should be taken to reduce the inversion after removal of the tumour. Displacements of the uterus should also be corrected. Where degeneration occurs in a large fibroid particularly an interstitial fibroid it is best to perform hysterectomy.

If secondary hæmorrhage should take place it may have to be controlled by tamponage of the vagina or in some cases it may be wiser to operate and remove the uterus.

In all cases where fibroids have been noted during the puerperium the patient should be cautioned about them examined eight to twelve weeks later, and suitable treatment adopted. Occasionally the fibroids share in the involution of the uterus and atrophy, but in the majority of cases especially with big fibroids, the patient should be advised to undergo treatment at a later stage.

CHAPTER XXXVI

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

Ovarian Tumours complicating Pregnancy and Labour

Tumours of the ovary complicating pregnancy may be either cystic or solid.

Among the *cystic tumours* are —

Simple serous cysts	Multilocular cysts
Dermoid cysts	Papilliferous cysts

The *solid tumours* are —

Fibromata	Adenomata
Malignant tumours either carcinomata or sarcomata	

CYSTIC TUMOURS

The commoner varieties met with are the simple serous or multilocular cysts. Next in frequency come the dermoids. Solid tumours of the ovary are comparatively rare, occurring perhaps in less than 5 per cent. of the cases.

Effect of Pregnancy on Ovarian Cysts. Pregnancy does not appear to have any particular effect upon the growth of ovarian cysts in contradistinction to its well known effect on fibromata.

Other changes however may take place which are torsion rupture or infection. Infection is more likely to occur during the puerperium than in pregnancy. Incarceration suppuration and necrosis may also take place. This is more frequently so with dermoid cysts which have a tendency to remain in the pelvis than with the ordinary types of simple serous or multilocular cysts.

Effects of Ovarian Tumours on Pregnancy These depend upon the size and situation of the tumour. In the early weeks of pregnancy ovarian tumours may give rise to pressure symptoms particularly referable to the bladder. There is a greater tendency

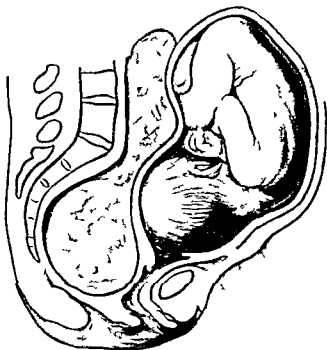


FIG 145.—Ovarian tumour obstructing labour (Dumm)

for abortion and miscarriage and in some cases the subjective symptoms of the first trimester of pregnancy such as nausea vomiting etc are exaggerated. In the later weeks pain is not infrequently complained of and difficulty in micturition may persist. Owing to the increase in the size of the abdomen disturbances in the respiratory and circulatory systems may occur as well as other pressure symptoms usually associated with an overdistended abdomen. Malpresentations are likely to occur particularly in those cases where the ovarian cysts remain either wholly or partially pelvic. In some cases the uterus may be displaced laterally or forward and when this is marked malpresentations and malpositions of the foetus occur.

Symptoms The presence of ovarian cysts may not give rise to any symptoms whatsoever particularly if they are of moderate size and not confined to the pelvis. The symptoms referable to ovarian cysts are generally due to —

- (1) Incarceration
- (2) The large size of the tumour
- (3) The complications that may set in consequent upon changes in the tumour

Incarceration When ovarian cysts such as dermoids are situated in the pelvis pain frequency of micturition and retention of urine constipation shooting pains down the thighs and in the early period of pregnancy an exaggeration of reflex symptoms like nausea vomiting etc. may be present.

When the tumours are of large size they produce pressure symptoms generally from the twenty eighth week of pregnancy onwards as in association with the gravid uterus the abdomen becomes overdistended dyspnoea precordial pain dyspepsia constipation difficulty in micturition and symptoms referable to pressure upon the veins nerves and the other abdominal viscera may be noticed.

More often when a patient complains of symptoms they are associated with changes in the ovarian cyst namely torsion rupture or infective changes.

Torsion This complication occurs not infrequently during pregnancy but more often during the puerperium. It is supposed to be slightly more frequent in association with pregnancy than in the non gravid condition. The symptoms are sudden and severe pain in the abdomen associated with all the features of shock and collapse tenderness and a slight amount of abdominal rigidity may also be present. The pulse is rapid the patient presents an anxious expression cold clammy sweats may occur and depending upon the amount of the hæmorrhage that has occurred into the cyst the patient may show the typical symptoms of hæmorrhagic collapse.

On abdominal palpation the tumour may be palpable and if it has been previously noted an increase in its size may be observed. Torsion may be more gradual in which case pain and associated symptoms are less severe.

As a result of torsion the tumour may rupture or give rise to adhesive peritonitis. In some cases the adhesions may be to the bowels and the tumour becomes infected.

Rupture of an ovarian cyst is comparatively rare during pregnancy.

Infective changes (suppuration and necrosis) are probably due to conditions quite independent of the gravid state or in some

cases suppuration may have existed before the onset of pregnancy. Suppuration, however, is more likely to occur during the puerperium, especially if infection of the parturient canal occurs.

Diagnosis. The diagnosis is not usually difficult. When the tumour is in the pelvis and the pregnancy is not far advanced a careful bimanual examination will reveal the presence of the cystic tumour alongside of the enlarged uterus.

In the later weeks the tumour may be felt either in the pelvis or in the abdominal cavity by palpation, as a distinct cystic tumour separate from the gravid uterus. Where the cystic tumour is situated posteriorly and there is considerable amount of enlargement of the abdomen, it may be difficult to define the outlines of the tumour and the gravid uterus separately. In such cases if the fetus in the uterus can be palpated easily and an X-ray photograph does not reveal any abnormalities, such as twins, etc., it may be presumed that the associated distension of a cystic nature is most likely due to an ovarian cyst complicating pregnancy.

Sometimes an ovarian cyst may be confused with a fibroid. Occasionally a retrodisplaced gravid uterus may have to be differentiated from an ovarian cyst complicating pregnancy. A careful bimanual examination and the noting of the position of the cervix and the fundus will help in clearing up the point at issue.

In the earlier weeks of pregnancy a small ovarian cyst may be mistaken for an extra-uterine gestation. Particularly is this mistake likely to arise when it undergoes torsion. The symptoms of hæmorrhage and collapse together with a soft swelling which may occasionally be pulsatile and felt in the pouch of Douglas, may give the impression of a ruptured extra-uterine pregnancy. It may be noted, however, that no external sign of bleeding is likely to occur. A laparotomy is indicated in both conditions, and the diagnosis may only be cleared up at operation.

A very rare complication met with once was the condition of torsion of an enlarged spleen with pregnancy, which was mistaken for either torsion of an ovarian cyst or a ruptured ectopic pregnancy. On opening the abdomen it was found that an enlarged movable malarial spleen had undergone a twist of its pedicle; the spleen was extremely congested, very vascular, and a certain amount of free blood was found in the abdominal cavity. The uterus was sixteen weeks pregnant. Splenectomy was done and the patient made an uneventful recovery, pregnancy going on to term and ending with a spontaneous delivery.

Treatment. It is now a well accepted rule that when an ovarian tumour is diagnosed during pregnancy it should be removed at once irrespective of the size, nature or position of the tumour. The uncertainties with regard to the growth of the tumour and the changes it may undergo, and the complications

likely to occur during pregnancy labour and the puerperium make this a very sound policy to adopt. We have invariably removed ovarian cysts noted during pregnancy from as early as the eighth week to very nearly full term.

Occasionally it may be desirable if there are absolutely no symptoms to postpone the operation for a few weeks in the second or third month of pregnancy so as to avoid the possibility of abortion otherwise there need be no hesitation in operating at as early a stage as possible.

When the ovarian tumour has to be removed at or near full term, the question of delivering the child by Caesarean section has to be considered so as to avoid the strain of labour with a recent abdominal scar and to relieve the woman of the pains incidental to delivery. No fixed rule can be laid down but each case has to be considered on its own merits. It is possible that if the operation is done at term in a primipara one may have to consider the possibilities of delivering by Caesarean section. Theoretically the best method of treatment is to remove the tumour by the abdominal route and to let the child be born *per via naturalis*.

There are exceptions to the general rule of immediate removal of the tumour. If a small cyst is noted well out of the pelvis either at or near term it may be well to leave it alone till the patient has been delivered and recovered from the puerperium. In cases where after opening the abdomen the tumour is adherent and exceedingly vascular and the extirpation of the tumour is associated with considerable risk of hæmorrhage the tumour may have to be tapped and pregnancy allowed to proceed. As an alternative the removal of the tumour may necessitate the performance of a hysterectomy as well owing to the intimate association of the tumour with the gravid uterus.

Immediate operation is necessary in cases where torsion of the ovarian cyst has occurred as well as in those conditions where inflammatory changes or rupture of the cyst have taken place. In cases where severe pressure symptoms are present or where there is a suspicion of malignancy an operation is indicated.

LABOUR COMPLICATED BY OVARIAN TUMOURS

In some cases the presence of the ovarian cyst may not have been diagnosed before labour or the patient may come under observation for the first time when she is in labour. The effect of labour on ovarian tumours will depend on the position size mobility and contents of the tumour. When the tumour is above the presenting part it may be ruptured by the contractions of the uterus or its pedicle may become twisted or in some cases it

may be so compressed that later in the puerperium it may undergo inflammatory changes. When the tumour is below the presenting part the pressure of the presenting part may crush or rupture it. In some cases the birth of the child may occasionally displace the tumour upwards into the abdominal cavity where it may undergo torsion.

The Effect of Ovarian Tumours on Labour This again depends on the size and situation of the tumour. When the tumour is pelvic it will certainly interfere with the descent of the presenting part the extent of the interference depending upon its size and relative hardness. For this reason dermoid cysts are more likely to cause obstruction to labour than simple serous cysts of the ovary. Malpresentations and malpositions as a result of the presence of ovarian cysts have already been referred to. The presence of the tumour may interfere with the proper uterine contractions and favour uterine inertia and postpartum hemorrhage.

Treatment If the tumour is situated above the presenting part and obstruction is not likely to result labour may be allowed to progress and the removal of the tumour considered at a later stage. Even in those cases where the tumour is pelvic it must be realised that there is a tendency for the tumour although not so marked as in fibroid tumours to rise into the abdominal cavity, especially when the tumour has got a fairly long pedicle. As an alternative it is possible gently with the woman in the knee-chest or knee-elbow position to manipulate and push it up above the presenting part into the abdominal cavity where it may not cause any further trouble.

If however the tumour continues to remain in the pelvis and is likely to cause obstruction it is better to operate early and deliver the woman by Cæsarean section and remove the tumour at the same time. In some cases it has been suggested that the tumour may be removed and labour terminated through the natural passages. This may perhaps be done if the woman has progressed sufficiently in labour and the cervix is dilated so that after the removal of the tumour by the abdominal route it is possible almost immediately to deliver the fœtus through the vaginal route either by the application of forceps or by version and extraction. In cases where this is not possible and the woman has already been some time in labour it is better to perform a lower segment Cæsarean section and deliver the fœtus and then remove the ovarian cyst.

Occasionally complications may co-exist such as adhesions or tortuous veins which may render it difficult to remove the ovarian cyst and under such circumstances considering the condition of the patient it may be desirable to tap the cyst and complete the delivery and wait a more favourable opportunity at a later date to deal with the tumour.

PUERPERIUM COMPLICATED BY OVARIAN TUMOURS

During the puerperium ovarian tumours tend to suppurate if there is any puerperal sepsis. Another complication not infrequently met with is twisting of the ovarian cyst which is favoured by the rapid involution of the uterus during this period the laxity of the abdominal walls and the increased mobility of the abdominal viscera. Cysts of the ovary which have been crushed or ruptured may necrose and get infected in the puerperium.

Treatment There is no particular necessity to remove these tumours during the puerperium unless they undergo degenerative changes infection suppuration torsion or rupture of the cyst are the common indications necessitating immediate laparotomy and removal.

SOLID TUMOURS OF THE OVARY

These may be sarcomata fibromata adenomata or carcinomata. Ovarian fibromata if they are bilateral generally lead to sterility. Solid tumours are more likely to be situated in Douglas pouch and to obstruct the course of labour.

Operations on these tumours in the later weeks of pregnancy may present difficulty because of the need to eviscerate the gravid uterus before they can be exposed and removed. The risk of hæmorrhage may also necessitate postponement of the operation till the woman goes into labour.

SUMMARY OF TREATMENT OF OVARIAN TUMOURS

At the time of labour tumours of the ovary should be treated as conservatively as possible. It is often possible to push up ovarian tumours cystic or solid above the pelvis and let labour continue. If however the tumour is definitely obstructing labour treatment depends upon whether one is dealing with a clean or suspect case.

In clean cases two methods are available —

(1) The patient may be given a trial labour to see if the ovarian tumour can be pushed out of the way. If this is not successful abdominal section is performed the ovarian tumour is removed and labour allowed to terminate through the natural passages.

(2) A Cæsarean section followed by an abdominal ovariectomy.

In suspect cases it may be possible to do an abdominal ovariectomy and deliver the fœtus through the vaginal route. The alternative is to do an abdominal ovariectomy with a lower segment Cæsarean section.

The third method is vaginal ovariectomy or vaginal tapping through Douglas pouch but the latter is done only as an emergency measure.

If an ovarian cyst is left alone during labour the patient should be watched carefully during the puerperium for any signs of twisting infection, etc. and if necessary an abdominal section is to be performed during the puerperium.

CANCER COMPLICATING PREGNANCY

The commonest site of cancer of the generative tract complicating pregnancy is the cervix.

The increased vascularity and softness of the cervix lead to a very rapid growth and spread of the cancer, usually pregnancy occurs in a uterus already the seat of a malignant cervical neoplasm and it is rare for cancer to occur after conception. It is said occasionally to favour placenta prævia.

During labour it may cause obstruction due either to rigidity of the cervix or the site of the tumour. Hemorrhage may be very severe the result of extensive tears which may be produced, and severe infection may occur during the puerperium because of the proximity of a sloughing malignant focus to the placental site.

Diagnosis is fairly simple there being an indurated ulcer which bleeds freely on examination. In doubtful cases a piece of cervix must be sent for microscopical examination.

Treatment will depend upon the extent of the cancerous growth and the period of pregnancy at which the patient first comes under observation. Depending upon these two factors the case may be classified under one of four groups —

- (1) Cases of cancer at an early stage with early pregnancy
- (2) Advanced cancer of the cervix with early pregnancy
- (3) Cases of cancer at an early stage with pregnancy advanced to thirty two weeks or over (child viable)
- (4) Advanced cancer of the cervix in the later weeks of pregnancy

(1) *Cancer with Early Pregnancy* Two courses are open in such cases —

(i) Radical treatment by operative methods with the termination of pregnancy that is panhysterectomy (Wertheim's operation)

(ii) Radium therapy with or without abdominal hysterotomy. It is a moot point whether abdominal hysterotomy should be done as a preliminary to radium treatment. The advantages claimed are that the introduction of radium into the cervical canal may lead to abortion and if it does occur the subsequent risks of uterine sepsis are obvious. Occasionally even if abortion does not occur and pregnancy progresses the effect of radium on the fœtus must be considered. It has now been shown that radium has got an adverse effect on the growing ovum and that fœtal development

may be arrested or defective development of the brain result leading later to congenital idiocy. From this point of view therefore it would appear that a hysterotomy or even better a supravaginal hysterectomy so as to remove the placental site and further reduce the chance of sepsis is much the better line of treatment to adopt before radium therapy is resorted to in these cases of cervical cancer complicating pregnancy.

(2) *In inoperable cases of cancer cervix complicating pregnancy in the early weeks* radium treatment combined with deep X ray therapy is the only method available. In such cases it is desirable to perform a supravaginal hysterectomy so as to minimise the chances of infection of the uterine cavity from the necrotic and infected malignant cervix. It is no use considering the possibility of getting a live child as by the time the pregnancy can advance to this stage the woman's condition will have so deteriorated that she will have lost any chance of surviving. Apart from this consideration the associated risks and pain necessitate early treatment of the cancer and make it safe to terminate the pregnancy.

(3) *Early Cancer and Late Pregnancy* When cancer is recognised in the later weeks of pregnancy the question naturally arises whether it may not be possible to temporise for a short time so that the child is not merely viable but capable of being reared after delivery. This decision will depend upon the condition of the cancer and the possibility of keeping the patient under observation. Consistent with this policy treatment may be delayed a few weeks. The treatment most to be favoured is radium therapy. If the foetus is presenting by the cephalic pole it is better to convert it into a podalic presentation before the application of radium. The effects of radium would not then be felt on the cephalic pole and the consequent atrophy or interference with the development of the brain of the foetus would not occur. After the application of radium labour should always be terminated by the abdominal route.

The question of a supravaginal or total hysterectomy may also have to be considered at the same time.

(4) *In inoperable cases of cancer observed in the later weeks of pregnancy* radium therapy is the only method of treatment. Provided the precautions mentioned above are taken it is better to apply radium as soon as possible so as to lessen the chances of sudden hæmorrhage and the risk of infection spreading up. Labour should always be terminated by the abdominal route and it is preferable because of the infection present in the cervix to perform a supravaginal hysterectomy after Cæsarean section.

It may be stated here that the position with regard to the methods of treatment of cervical cancer has undergone a remarkable

change in recent years because of the more extended use of radium and deep X ray therapy. It is now felt by most gynaecologists that equally good results are obtained by radiation therapy and without the serious risks associated with a radical operation. When radium is used in the early weeks of pregnancy however it is well known that there is considerable risk of causing serious developmental defects in the foetus and because of this evacuation of the uterus before radiation even in early pregnancy is fully justified. Radiation late in pregnancy does not apparently carry with it so grave a risk to the child particularly if the precaution is taken of converting the presentation to a breech before the application of radium is made.

Intimately associated with this question is that of possible dangers to the future offspring by preconceptional irradiation. At present radium is extensively used for conditions such as metro pathia hæmorrhagica and fibroid, and occasionally pregnancy does follow such treatment. The following general considerations may be borne in mind when preconceptional irradiation is resorted to —

(1) Pregnancy following preconceptional irradiation for metro pathia hæmorrhagica, fibroid tumours or for sterilisation proceeds normally and with few exceptions parturition is normal. When however a stenosed fibrotic cervix is likely to cause obstruction Cæsarean section should be performed.

(2) There is no definite evidence of preconceptional radium therapy affecting the child.

Cancer of the body of the uterus complicating pregnancy is extremely rare and when it does occur the chances are that abortion will result.

Cancer of the vagina or the vulval outlet may sometimes complicate pregnancy. The treatment adopted should be to deal with the cancer at as early a stage as possible by radium therapy and to terminate the pregnancy by the abdominal route.

Cancer complicating the Puerperium. When a patient with cancer of the cervix or of the lower genital tract has been delivered through the natural passages every effort should be made to try and prevent the spread of infection to the uterus.

CHAPTER XXXVII

CONTRACTED PELVIS

In a contracted pelvis one or other of the diameters in one or other of the planes is shorter than normal. The contraction may be at the brim of the pelvis or at the outlet or the brim cavity and the outlet may all be involved. The contraction may also be

symmetrical or asymmetrical and so cause several varieties of deformity

It is not possible to state definitely what constitutes a normal pelvis for it depends upon several factors and varies in different countries. It is therefore wiser to lay down standards for particular countries and communities rather than adopt a uniform standard for all. What may be styled a normal pelvis in some of the European countries differs from the Indian standard and this in turn differs from the standard of the inhabitants of Africa. Jewish women are said to have a relatively small pelvis. Taking these facts into consideration it may be stated that deviations in size or shape from the normal standard of each country or race constitutes a contraction of the pelvis.

Classification

The most common method of classifying contracted pelvis is according to the etiology and pathology. There are some well known systems of classification which are recognised generally by obstetricians. Of these the important ones are —

- (1) Litzmann's classification
- (2) Schauta's classification
- (3) Jellett's classification

1 LITZMANN'S CLASSIFICATION

- I Pelvis of normal shape but either too large or small (not a contracted pelvis)
- II Pelvis with abnormal shape
 - (a) Flat pelvis
 - (1) Simple
 - (2) Rachitic
 - (3) Generally contracted pelvis
 - (b) Transversely contracted pelvis
 - (c) Irregularly contracted pelvis
 - (1) Scoliosis
 - (2) Coxalgia
 - (3) Amputation
 - (4) Dislocation of femur
 - (5) Asymmetric sacrum or Naegele's pelvis
 - (d) Crushed pelvis the osteomalacic and pseudo-osteomalacic pelvis

2 SCHAUTA'S CLASSIFICATION

I The results of developmental anomalies

- (1) Generally contracted, not rachitic, pelvis
 - (a) Infantile pelvis
 - (b) Masculine pelvis
 - (c) Dwarf pelvis
- (2) Simple flat, not rachitic pelvis
- (3) Generally contracted flat not rachitic pelvis
- (4) Funnel shaped pelvis foetal type
- (5) Insufficient development of one wing of the sacrum (Naegele)
- (6) Insufficient development of two wings of the sacrum (Robert)
- (7) The generally too large pelvis (justo major)
- (8) The split pelvis Absence of closure of the symphysis pubis

II Anomalies the result of diseases of the pelvic bones

- (1) Rachitis
- (2) Osteomalacia
- (3) Neoplasms
- (4) Fracture
- (5) Atrophy, caries and necrosis

III Anomalies of the pelvic joints

- (a) Synostosis of one or more
- (b) Softening of one or more

IV Anomalies caused by diseases of the trunk

- (1) Spondylolisthesis
- (2) Kyphosis
- (3) Scoliosis
- (4) Kyphoscoliosis
- (5) Assimilation

V Anomalies the result of diseases of the supports of the pelvis

- (1) Coxitis
- (2) Dislocation of one or both femora
- (3) Club foot
- (4) Absence or inefficiency of one or both legs

3 JELLETT'S CLASSIFICATION

We prefer the classification adopted by Jellett which is simple and practical The classification of Jellett is here given—

A. Generally contracted pelvis

(1) Generally contracted.

(a) Non-rachitic.

(b) Rachitic.

(2) Dwarf pelvis.

B. Flattened pelvis.

(1) Flat pelvis.

(a) Non-rachitic.

(b) Rachitic.

(2) Generally contracted, flat pelvis

(a) Non rachitic

(b) Rachitic.

(3) Pelvis of congenital dislocation of the hip

C. Obliquely distorted pelvis.

(1) By spinal curvature—kyphoscoliotic

(2) By imperfect or abolished use of one limb—coxalgic pelvis

(3) By asymmetry of the sacrum—unilateral, synostotic pelvis—Naegele's pelvis.

D Transversely contracted pelvis.

The bilateral synostotic (or Robert's) pelvis

E. Funnel shaped pelvis.

(1) Developmental.

(2) Kyphotic

F. Compressed or triradiate pelvis.

(1) Rachitic.

(2) Osteomalacic

G. Roofed pelvis.

(1) Spondylolisthetic.

(2) Kyphotic.

*H. Pelvis narrowed by fractures, ossifications or tumours**I. Split pelvis.*

No perfect scheme of classification is possible in the present stage of our knowledge, but there are various factors which are responsible for the causation of contracted pelvis which should be borne in mind. Amongst such factors are —

Congenital Deformities. A large number of congenital deformities

are responsible for the causation of contracted pelvis Among these may be mentioned —

- (a) The infantile type
- (b) Insufficient development of one or both wings of the sacrum
- (c) Absence of closure of the symphysis pubis
- (d) Assimilation of the lumbar with the sacral vertebrae
- (e) Congenital dislocation of the hip joint
- (f) Clubfoot and deformities of one or both legs and absence or inefficiency of one or both legs, resulting in short stature

Diseased conditions which may be responsible for the production of a contracted pelvis, are —

- (a) Rickets
- (b) Tubercular diseases of the hip joint or sacro iliac joint or the spinal column
- (c) Deformities of the spinal column due to other causes
- (d) Osteomalacia
- (e) Fractures of the pelvis or of the lower extremities resulting in malunion
- (f) Caries and necrosis
- (g) New growths

FREQUENCY

The frequency of contracted pelvis is variously estimated by observers in different countries This is possibly due to the lack of a definite standard being available for classifying contracted pelvis the greater incidence of certain ætiological factors such as rickets and osteomalacia in some countries naturally leads to the more frequent occurrence of contracted pelvis in such countries

Even in India the proportion of major degrees of contracted pelvis is less in Southern India than in parts of Northern India, where osteomalacia is much more frequently met with

The commoner varieties of contracted pelvis are —

- (1) The generally contracted pelvis
- (2) The flat pelvis
- (3) The generally contracted and flat pelvis

Others less frequently encountered are the funnel shaped pelvis, the triradiate pelvis and the oblique & distorted pelvis

Diagnosis of Contracted Pelvis

The importance of diagnosing the existence of a contracted pelvis before the onset of labour must be clearly realised With this end in view, careful pelvic measurements must be taken in

every case where the woman is pregnant for the first time and in all cases where a history of previous difficult labour is noted. The following points require consideration.

History The history of early infancy is always useful as any evidence of rickets at this period must indicate to the practitioner the possibility of some degree of rachitic deformity being present. In the later period a history of any disease such as tuberculosis affecting the joints or any trauma leading to fracture of the pelvis femora or any other bone of the lower extremity may suggest deformity.

During pregnancy any history which suggests the signs and symptoms of osteomalacia should be carefully noted. This disease is far more common at the time of pregnancy and leads to a typical deformity if left untreated.

The history of previous deliveries is most valuable and should always be carefully elicited. It is necessary to note whether the delivery was at full term whether it was spontaneous or assisted whether the child was born alive or dead or was difficult to resuscitate and eventually succumbed a few hours or days after delivery.

A history of assisted delivery is of great value particularly if the details are available as to the indications for and nature of the aid given.

Because of this it should be considered the duty of every obstetrician who attends at a difficult labour to give a concise report of the nature of delivery the reason for interference the particular difficulty that was experienced the cause of delay and the type of pelvis that was met with. The mother should be instructed to show this report to the obstetrician who attends at her next delivery. At no time is it possible to arrive at a more satisfactory opinion regarding the type and degree of contracted pelvis and its influence on the passage of the foetus than at the time of labour and it is most unfortunate if such valuable information gained often at considerable risk to both mother and child is not made available at a subsequent delivery. We would commend this matter to the attention of all obstetricians called upon to assist at a case of difficult labour.

When there is a history of a destructive operation being necessary it indicates a serious degree of disproportion. It is a rule that whenever we have dealt with a case of serious disproportion we not only give particulars of the difficulty that we had to negotiate but add what in our opinion would constitute the most favourable method of delivery should the patient again become pregnant. This seems to be the only logical method to adopt and it is for the next attendant to decide how far the advice offered can under the circumstances be utilised at the subsequent delivery.

Per contra, it is equally useful to record a negative history of no disproportion or pelvic deformity. It must, however, be stated that this is of limited value, in view of the fact that between two deliveries conditions may occur resulting in the production of a degree of deformity of the pelvis which may give rise to dystocia. Thus, in fractures of the pelvis, as a result of accident, growth of tumours, and in the development of certain diseases like tuberculosis or osteomalacia, deformities may result which can cause dystocia in subsequent labours although previously there was no such difficulty.

Appearance and Gait The general appearance of the patient and the gait assumed by her very often suggest the possibilities of pelvic deformity. It is essential that



FIG 146 —Pendulous abdomen in a gravid woman.

the patient be stripped and examined in a good light and her gait carefully watched. Small stature, pendulous abdomen, deformities of the spine, shortness of one or other of the extremities, obvious tilting of the pelvis, bow-legs, genu valgum, club-feet, or a relative disproportion between the upper half of the body and the lower half, as in cases of achondroplastic dwarfs, and a waddling gait, would all suggest pelvic deformity. Other evidence of rickets must also be looked for, such as a rickety rosary, deformities of the chest, obvious curvature of bones, etc.

Abdominal Examination. Having noted the general appearance of the patient she should be made to lie flat on a couch and the abdomen examined. Undue prominence of the abdomen, uterine obliquity and abnormal elongation of the uterus transversely should all be looked for. Abdominal palpation, if the woman is at or near full term, gives useful information relative to the presence or absence of a contracted pelvis. Malpresentations or malpositions of the fœtus, non-engagement of the head in primiparæ, particularly if during labour at full term, and overriding of the symphysis pubis by the fœtal head, are all indicative of disproportion which may be due to pelvic contraction.

Pelvimetry

Pelvimetry is by far the most certain method of diagnosing contracted pelvis. Accordingly in all cases, especially where there is a suspicion of contraction, and in every primigravida, pelvic

measurements should invariably be taken and recorded. These are grouped as *external* measurements and *internal* measurements.

External Pelvimetry

This is done by using a pelvimeter such as that devised by Matthews Duncan, or Martin, or Budin. The external pelvic measurements of obstetrical importance are seven in number. They are —

- (1) The *interspinous diameter*, which is the distance between the outer borders of the anterior superior iliac spines.
- (2) The *intercristal diameter*, which is the distance between the most distant portions of the outer borders of the iliac crests.
- (3) The *external conjugate*, or *Baudelocque's diameter* which extends from the depression just beneath the spinous process of the last lumbar vertebra to the anterior and upper margin of the symphysis pubis.
- (4) The *transverse diameter of the outlet* which is the distance between the two ischial tuberosities.
- (5) The *anteroposterior diameter of the outlet* which is the distance between the under surface of the symphysis pubis and the tip of the coccyx.
- (6) The *distance between the posterior superior iliac spines*.
- (7) The *distance between the femoral trochanters*.

When the pelvis is to be measured externally the patient should be made to lie perfectly flat and straight with her abdomen and hips exposed, or covered only by a very thin piece of cloth. The pelvimeter is held by the free ends of the arms between the thumb and index finger of each hand and brought in contact with the various anatomical bony points and pressed against them fairly firmly.

In taking the interspinous diameter, the outer edges of the anterior superior spines are first noted and the tips of the pelvimeter pressed against them.

In measuring the intercristal diameter, the most widely separated points are located and the tips applied to the outer lip of the ridge. It is necessary to note this as both at the crests of the ilium as well as at the superior spines the bones present an outer and an inner lip with an intermediate ridge so that if the inner lips are taken a difference of 1 to 1.5 centimetres between the outer and the inner measurements may result.

The measurement of the external conjugate may present difficulties in fat women. This is due to the difficulty experienced in locating exactly the point on the dorsum of the trunk to which

the pelvimeter has to be applied. In most cases the spinous process of the last lumbar vertebra can be easily made out and

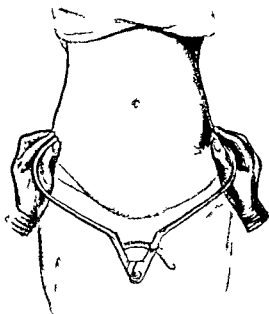


FIG. 147.—External pelvimetry. Method of measuring the interspinous diameter.

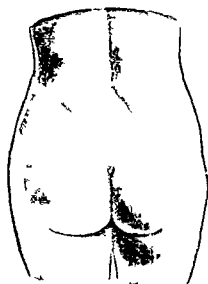


FIG. 148.—Michaelis's rhomboid.

the depression just below the spine is the point from which the measurement has to be taken. A second method of arriving at this point is by taking the superior angle of Michaelis's rhomboid.

whose upper and lower margins are formed by the sacrospinous and gluteus muscles respectively

A third method of locating this particular point is to take a point one inch above the line joining the posterior superior iliac spines

In ascertaining the intertrochanteric diameter the most prominent points of the trochanters are carefully located and the tips of the pelvimeter then pressed firmly against them so that they come in as intimate contact with the bone as possible

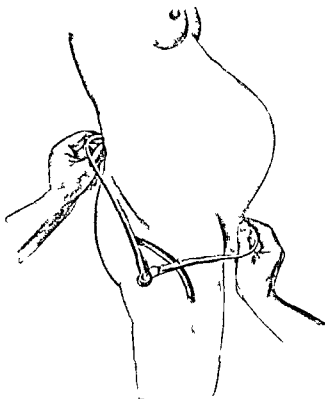


FIG. 149.—External pelvetry. Method of measuring the external conjugate diameter

Average Normal Measurements The following are the average measurements —

Interspinous diameter	10½ inches
Intercristal diameter	11½
External conjugate	8
Intertrochanteric diameter	12½
Posterior superior iliac spines	3½
Anteroposterior diameter of the outlet	4½

It may be stated that so far as South Indian women are concerned the measurements are fully one inch less than those recorded as average measurements for the interspinous intercristal

and external conjugate diameters Thus if a woman has a pelvis with the following measurements—

Interspinous diameter	9½ to 10 inches
Intercristal diameter	10½ 11
External conjugate	7 7½ ,

it may be taken that these measurements are average and do not indicate contraction

A study of the pelvic measurements noted above will enable us in a large number of cases to determine whether the pelvis is contracted and if so the variety of contraction

(1) *Generally Contracted Pelvis* In this variety all the measurements are proportionately reduced As an illustration we may state that if the measurements are—

Interspinous diameter	8½ inches
Intercristal diameter	9½
External conjugate	6½ ,

the pelvis is distinctly of the generally contracted variety

(2) *Flat Pelvis* Here the usual proportion between the intercristal and the interspinous diameters is not maintained Generally there is a difference of at least one inch between these two but in a flat pelvis this is reduced sometimes by half an inch or more Typical measurements would therefore be —

Interspinous diameter	9½ inches
Intercristal diameter	10
External conjugate	6½

(3) *Generally Contracted and Flat Pelvis* In this not only is there a reduction in all the measurements but the proportion between the intercristal and the interspinous diameters of a normal shaped pelvis is not maintained Thus the measurements may be —

Interspinous diameter	8½ inches
Intercristal diameter	9 ,
External conjugate	6½

(4) *Funnel shaped Pelvis* If the measurements of the outlet are reduced and the measurements at the brim of the pelvis as represented by the intercristal interspinous and the external conjugate are more or less normal it is suggestive of a funnel shaped pelvis Such may be either a transversely contracted funnel shaped pelvis or an anteroposteriorly contracted funnel shaped pelvis depending upon whether the transverse diameter is reduced or the anteroposterior diameter is reduced

(5) If the distance between the posterior superior iliac spines which is normally 3½ inches is diminished one of two varieties of contraction may be present —

- (a) Obliquely distorted pelvis (Naegele's pelvis)
- (b) Transversely contracted pelvis (Robert's pelvis)

and external conjugate diameters Thus if a woman has a pelvis with the following measurements—

Interspinous diameter	9½ to 10 inches
Intercristal diameter	10½ 11 "
External conjugate	7 7½

it may be taken that these measurements are average and do not indicate contraction

A study of the pelvic measurements noted above will enable us in a large number of cases to determine whether the pelvis is contracted and if so the variety of contraction

(1) *Generally Contracted Pelvis* In this variety all the measurements are proportionately reduced As an illustration we may state that if the measurements are—

Interspinous diameter	8½ inches
Intercristal diameter	9½
External conjugate	6½

the pelvis is distinctly of the generally contracted variety

(2) *Flat Pelvis* Here the usual proportion between the intercristal and the interspinous diameters is not maintained Generally there is a difference of at least one inch between these two but in a flat pelvis this is reduced sometimes by half an inch or more Typical measurements would therefore be —

Interspinous diameter	9½ inches
Intercristal diameter	10
External conjugate	6½

(3) *Generally Contracted and Flat Pelvis* In this not only is there a reduction in all the measurements but the proportion between the intercristal and the interspinous diameters of a normal shaped pelvis is not maintained Thus the measurement may be —

Interspinous diameter	8½ inches
Intercristal diameter	9 "
External conjugate	6½

(4) *Funnel-shaped Pelvis* If the measurements of the outlet are reduced and the measurements at the brim of the pelvis as represented by the intercristal interspinous and the external conjugate are more or less normal it is suggestive of a funnel shaped pelvis Such may be either a transversely contracted funnel shaped pelvis or an anteroposteriorly contracted funnel shaped pelvis depending upon whether the transverse diameter is reduced or the anteroposterior diameter is reduced

(a) If the distance between the posterior superior iliac spine which is normally 3½ inches is diminished one of two varieties of contraction may be present —

(a) Obliquely distorted pelvis (Naegele's pelvis)

(b) Transversely contracted pelvis (Robert's pelvis)

sterilising the instrument the rigid limb is passed inside the vaginal cavity and adjusted against a particular point while the flexible limb is adjusted to a point outside. Thus in arriving at the measurement of the true conjugate, guided by the fingers in the vagina the rigid limb is first applied to the sacral promontory, the flexible limb being adjusted on the anterior surface of the symphysis pubis. The two limbs are steadied by screws, the instrument is then removed and the distance between the two points read on a scale. The instrument is now reintroduced with the curvature of the rigid limb pointing forward, and is applied to the most prominent point on the posterior surface of the symphysis pubis. The flexible limb is applied to the same point on the anterior surface as before, the limbs are fixed and the instrument taken out and

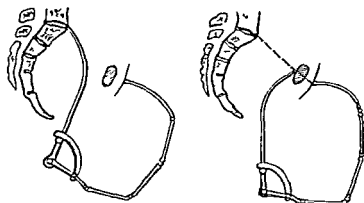


FIG. 150.—Internal pelvimetry. Method of measuring the true conjugate by Shutech's instrument.

the
shaped pelvis

Distance between the two points read on the graduated scale
In difference between the two readings gives the actual measure
Expressed as true conjugate

(4) Funnel-shaped manner the transverse diameter of the pelvis may be reduced or increased.

represented by other instruments which have been devised to measure the true conjugate. In most of these cases the funnel-shaped pelvis is so used that one limb can be applied on to the sacral promontory, the other to the most prominent point on the symphysis pubis.

reduced or the and *Bimanual Methods* (a) The obstetrical conjugate

(5) If the distance from the measurement of the diagonal conjugate which is normally the *Diagonal Conjugate*. The patient is put in the contraction may be the external genitalia cleansed and with all

(a) Obliquely with the middle and forefingers of the right hand

(b) Transversely the vagina until the tip of the middle finger impinges

on the sacral promontory and the radial surface of the index finger is pressed against the subpubic ligament. With the index finger

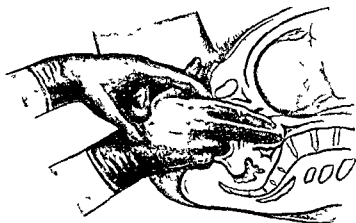
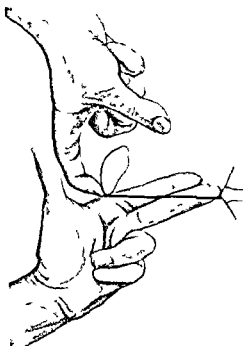
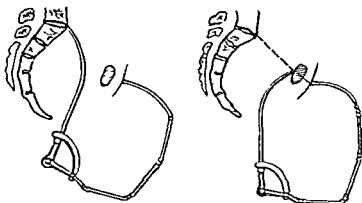


FIG. 151.—Internal pelvimetry. Method of measuring the diagonal conjugate

of the other hand, the point of contact of the index finger in the vagina with the lower margin of the symphysis pubis is marked



sterilising the instrument the rigid limb is passed inside the vaginal cavity and adjusted against a particular point while the flexible limb is adjusted to a point outside. Thus in arriving at the measurement of the true conjugate guided by the fingers in the vagina the rigid limb is first applied to the sacral promontory the flexible limb being adjusted on the anterior surface of the symphysis pubis. The two limbs are steadied by screws the instrument is then removed and the distance between the two points read on a scale. The instrument is now reintroduced with the curvature of the rigid limb pointing forward and is applied to the most prominent point on the posterior surface of the symphysis pubis. The flexible limb is applied to the same point on the anterior surface as before the limbs are fixed and the instrument taken out and



on the sacral promontory and the radial surface of the index finger is pressed against the subpubic ligament. With the index finger

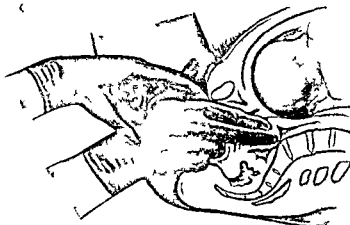


FIG. 141.—Internal pelvimetry. Method of measuring the diagonal conjugate.

of the other hand, the point of contact of the index finger in the vagina with the lower margin of the symphysis pubis is marked



measured with calipers. This gives the length of the diagonal conjugate and the true conjugate is estimated by deducting about $\frac{1}{2}$ to $\frac{3}{4}$ in from this measurement, depending upon the height and inclination of the symphysis pubis.

(b) Another method of measuring the true conjugate is by the introduction of the whole hand inside the vagina and measuring the true conjugate by pressing the little finger against the sacral promontory while the thumb is extended sufficiently to meet the undersurface of the symphysis pubis. The hand is then removed and stretched in the same position as in the vagina and the measurement taken by means of calipers. This method of measurement is practicable only after delivery and cannot ordinarily be applied where the measurement has to be ascertained during labour.

Lastly we must emphasise this fact that external and internal pelvimetry are only useful as guides to the diagnosis of pelvic contraction thereby helping us at arriving at the fundamental question whether there is disproportion between the presenting part and the pelvis in any given case. The most essential point for final consideration is therefore not one of the pelvic measurements but *one of the relative size of the foetal head and the maternal pelvis*. Hence the truth of the statement made by Barbour that the best pelvimeter in the practice of obstetrics is the foetal head must never be forgotten.

Radiographic Examination In recent years several attempts have been made to determine the nature and degree of contracted pelvis by the use of radiography. It is undoubtedly of value in the recognition of certain types of deformed pelvis such as Naegele's pelvis, Robert's pelvis, split pelvis and contracted pelvis due to bony growths. Methods have been recently described for estimating the degree of contraction in cases of flat and generally contracted pelvis. Stereoscopic pictures as well as the use of graduated metal sheets have been tried but much work yet remains to be done to enable us to judge with any degree of accuracy, by the radiograph alone the extent of contraction in these types of pelvis.

more likely to occur in cases of flat pelvis or where the sacral promontory or the spinal column causes a mechanical obstruction to the free development of the gravid uterus upwards into the abdominal cavity.

In the later weeks of pregnancy the growing uterus tends to produce overdistension of the abdomen as the pelvis cannot accommodate any part of the fœtus. The fundus of the uterus may fall forward resulting in the condition of pendulous abdomen. The increased pressure of the gravid uterus on the diaphragm and the thorax may cause difficulty in respiration and cardiac distress. Since the pelvis does not allow any part of the fœtus to descend and tends to push the whole of the gravid uterus upwards into the abdominal cavity the height of the fundus may not correspond to the period of amenorrhœa. There is an increased tendency for malpresentations and unfavourable attitudes of the fœtus to appear and these later lead to increased dystocia.

During Labour The effect of contracted pelvis on labour depends upon the degree of contraction and upon the relative disproportion between the presenting part and the pelvis. In some cases it may not be possible for any progress to take place. In others labour is prolonged but may terminate either spontaneously or with artificial assistance and results in the delivery of a living or a still born child. Abnormal presentations such as breech, face, brow, shoulder and occipito posterior positions are relatively more frequent with contracted pelvis. Premature rupture of membranes favouring prolapse of the umbilical cord or a part of the fœtus like the arm or the foot is also common. This is due to the fact that the presenting part cannot fill the lower uterine segment and fit comfortably into the brim of the pelvis with the result that there is a free communication between the forewaters and the afterwaters. The bag of membranes tends to protrude in a cone shaped manner and the pressure in the fluid is so great that the membranes are likely to rupture prematurely. The gush of liquor amni forces down the cord or occasionally the hand or foot of the fœtus. Premature rupture of the membranes together with failure of the presenting part to fit in the lower uterine segment results in slow and imperfect dilatation of the cervix. The cervical lips may not be taken up but hang down loose and fringe like. The gradual drainage of liquor amni, the associated ineffective contractions of the uterus so frequently present and the increased resistance offered to the presenting part in its attempts to descend all lead to a prolongation of the first stage. The anterior lip of the cervix may be compressed between the symphysis pubis and the presenting part and becoming œdematous still further narrows the cervical os and prevents the further dilatation of the cervical canal. It would appear that in such cases a vicious

circle is set up, leading to failure of the response of the cervix to uterine polarity thus causing increased delay. The uterine contractions may also be at fault, being either inefficient or passing into inertia before labour is finished. In other cases, as a result of prolonged labour, the contractions of the uterus become tetanic and may ultimately lead to rupture of the uterus if the obstruction cannot be overcome. The continued contractions of the uterus lead to increased dilatation of the lower uterine segment, the walls of which become more and more stretched and dangerously thinned out so that rupture results. Such a condition of tetanic contraction requires immediate relief, as otherwise rupture is bound to occur. The danger of traumatic rupture in such cases should be borne in mind and great caution exercised in the course of delivery so as to avoid precipitating such a catastrophe by unskilful or ill-timed intra uterine manœuvres.

Effect on Soft Parts The prolongation of the stages of labour the continued pressure of the presenting part, particularly the cephalic pole, on the soft parts, and the consequent interference with the free circulation of blood, may lead to a pressure necrosis which is followed by sloughing and fistulous formation once the sloughs separate. Such fistulae are more common between the bladder and the vaginal cavity, but they may also occur between the rectum and the vaginal cavity. The increased compression of the soft parts also renders them more liable to infection and consequently puerperal sepsis develops. Where the head undergoes extreme moulding and a large caput is formed, the pressure exercised may lead to œdema of the perineum and the surrounding area and in such cases tears of the perineum are inevitable and such tears do not unite by first intention when sutured.

Effect on Joints and Bones The increased pressure of the presenting part may lead in some cases to subluxation of the joints and in others where delivery is effected with some amount of force to spontaneous rupture of the symphysis pubis or of one or both sacro iliac joints, and at the outlet fracture of the coccyx or subluxation of the sacro coccygeal joint may occur. These may lead later to a great deal of disability from defective gait, severe pain in the joints and coccydynia.

Effect of Labour on the Fœtus Usually the fœtus does not suffer from any bad effects so long as the membranes are intact. This statement however, requires to be qualified as sometimes symptoms of fœtal distress may manifest themselves and occasionally the fœtus may be born dead immediately after the membranes have ruptured. There are two obvious reasons for such an unfortunate fatality. In some cases the amount of liquor amni may not be sufficient to protect the fœtus from the severity

of the uterine contractions. It may not be sufficiently marked to be termed an oligohydramnios but a relative diminution of the total quantity of liquor amni can cause foetal distress in the first stage of labour. The other and perhaps more important reason particularly in cases of contracted pelvis is that occasionally in primiparae the head may mould and by the vigorous contractions of the uterus be forced into the pelvic cavity yet the membranes do not rupture because of a small bag of membranes. The undue prolongation of the first stage of labour in such cases has virtually the same effect upon the foetus as a prolonged second stage would have with the head in the cavity. The continued compression of the foetal head in the pelvic cavity is likely to lead to increased intracranial stress with hæmorrhage from tearing of the tentorium or falx cerebri.

After rupture of the membranes the prolonged uterine contractions exert a deleterious influence upon the foetus by interfering with the placental circulation by the prolonged pressure exerted upon the head resulting in excessive moulding and the formation of a large caput. The child may thus be asphyxiated or suffer from intracranial injuries leading to still birth asphyxia neonatorum or death during the neonatal period. The greater frequency of prolapse of the cord has already been referred to and as this condition occurs with imperfect dilatation of the os the risks to the foetus are obvious. The degree of obstruction that the foetal head has to overcome in its progress through a contracted pelvis determines the extent of damage that may be sustained. Among such foetal injuries are pressure marks on the scalp spoon shaped depressed fractures of the skull and various intracranial injuries which have been referred to already. The large caput succedaneum and the greater degree of moulding imply a greater degree and duration of compression of the head and therefore of the brain. Such pressure effects are felt by the vital centres particularly the respiratory centre and result in a deep degree of asphyxia at birth. The child may in those circumstances be revived with considerable difficulty yet may not survive the neonatal period. It is not unusual to observe that while the foetal heart beats persist for a time no attempts at respiration can be provoked.

Prognosis of Labour in Contracted Pelvis

From what has been stated above it will be obvious that the outlook for both mother and child is serious unless adequate treatment can be given at the proper time.

The Mother. The increased risks of rupture of the uterus sepsis exhaustion and shock and other injuries to the genital tract

as to what is the proper line to adopt in any given case. The difficulty is increased when deciding on a particular line of treatment in the presence of additional complications such as premature rupture of the membranes slow dilatation of the cervix prolapse of the cord and malpresentations. A point to be remembered—and sufficient emphasis cannot be laid on it—is that pelvimetry cephalometry and all methods of estimating relative disproportion are useful only up to a certain limit. The question can never be answered with absolute certainty whether or not a particular head will be able to mould through a particular pelvis whether or not a particular uterus will be able by effective contractions to push the head down in border line degrees of disproportion without causing undue risk to the mother or child. It is because of these two factors that surprises sometimes occur some of which are welcome while others unfortunately are very distressing. Cases must be within the experience of most obstetricians where a definite diagnosis of disproportion has been made and the question of a Cæsarean section seriously considered yet after only a couple of hours of good labour pains the head has passed the obstruction and indeed the whole delivery has been completed. On the other hand there are cases where the obstetrician has felt confident that the slight degree of disproportion would be easily overcome once strong uterine contractions appeared but either because of post maturity, or because of the relative hardness of the foetal skull moulding has been inappreciable and little or no progress has been made after hours of waiting. While such difficulties must of necessity be recognised it should be realised that with reasonable care and diligence it is possible to estimate with considerable accuracy the degree of disproportion and so assess the difficulties that may be experienced and the nature of the delivery that ought to be selected.

We shall now consider the different forms of delivery that are applicable in cases of labour complicated by contracted pelves. We refer later to the particular forms of delivery that are most appropriate for the different types and degrees of contracted pelves.

Spontaneous Delivery

It has already been stated that in some degrees of contracted pelvis spontaneous delivery can and does occur. In fact in slight degrees of contraction there is every possibility of delivery occurring spontaneously, though occasionally at the beginning of labour the non-engagement of the foetal head may give cause for some anxiety on the part of the obstetrician. It must be realised that in many of these cases at the onset of labour deflexion attitudes are present but get corrected when the uterus

make the prognosis for the mother very much more unfavourable. The risks to the mother depend upon —

- (1) The nature and degree of contracted pelvis
- (2) The presentation position and relative disproportion of the head to the maternal pelvis
- (3) The nature of the uterine contractions
- (4) The presence or otherwise of complications such as placenta prævia eclampsia the stage at which the patient comes under observation in labour the operative methods of delivery adopted and the facilities available at the time of labour and during the puerperium for her proper care

The increased risks of maternal mortality and morbidity are obvious from the nature of the complications that are likely to arise in the course of labour.

The Child The prognosis is unfavourable even when labour ends spontaneously. If the pelvic contraction is of a high degree the chances are perhaps better in view of the earlier recognition of the serious disproportion and adoption of abdominal modes of delivery. It is in the border line degrees of contracted pelvis that the contraction may not be recognised and that a great deal of judgment is required in selecting the proper method of treatment. It is here that the foetal prognosis will materially depend on the judgment experience and calm outlook of the obstetrician in charge. Errors in judgment hasty methods of operative delivery or, on the other hand delay in affording timely assistance in the vain hope that labour will perhaps terminate spontaneously are all likely to increase the risks to the foetus. In the large majority of cases death of the foetus is due to asphyxia the result of intracranial stress or interference with the placental circulation. The traumatic injuries of the foetal head to which it is liable during the course of labour add to the risks of the foetus. There are many other injuries that are likely to occur in the course of delivery in a contracted pelvis to which reference is made later.

CHAPTER XXXIX

MANAGEMENT OF LABOUR IN CONTRACTED PELVIS

No subject in the whole field of obstetrics presents a more difficult problem than the management of labour complicated by the presence of a contracted pelvis. It is not surprising that with the methods of estimating disproportion that are at present available there should be such difficulty and so much divergence of opinion

as to what is the proper line to adopt in any given case. The difficulty is increased when deciding on a particular line of treatment in the presence of additional complications, such as premature rupture of the membranes, slow dilatation of the cervix, prolapse of the cord and malpresentations. A point to be remembered—and sufficient emphasis cannot be laid on it—is, that pelvimetry, cephalometry, and all methods of estimating relative disproportion, are useful only up to a certain limit. The question can never be answered with absolute certainty, whether or not a particular head will be able to mould through a particular pelvis, whether or not a particular uterus will be able by effective contractions to push the head down in border line degrees of disproportion, without causing undue risk to the mother or child. It is because of these two factors that surprises sometimes occur, some of which are welcome, while others unfortunately are very distressing. Cases must be within the experience of most obstetricians where a definite diagnosis of disproportion has been made and the question of a Cæsarean section seriously considered, yet after only a couple of hours of good labour pains the head has passed the obstruction, and indeed the whole delivery has been completed. On the other hand, there are cases where the obstetrician has felt confident that the slight degree of disproportion would be easily overcome once strong uterine contractions appeared, but either because of post maturity, or because of the relative hardness of the foetal skull, moulding has been inappreciable and little or no progress has been made after hours of waiting. While such difficulties must of necessity be recognised, it should be realised that with reasonable care and diligence it is possible to estimate with considerable accuracy the degree of disproportion, and so assess the difficulties that may be experienced and the nature of the delivery that ought to be selected.

We shall now consider the different forms of delivery that are applicable in cases of labour complicated by contracted pelves. We refer later to the particular forms of delivery that are most appropriate for the different types and degrees of contracted pelves.

Spontaneous Delivery

It has already been stated that in some degrees of contracted pelvis spontaneous delivery can and does occur. In fact, in slight degrees of contraction, there is every possibility of delivery occurring spontaneously, though occasionally at the beginning of labour the non-engagement of the foetal head may give cause for some anxiety on the part of the obstetrician. It must be realised that in many of these cases, at the onset of labour, deflexion attitudes are present, but get corrected when the uterus

the test labour, nor is it justifiable to attempt delivery through the vaginal route by the application of high forceps to a head that is virtually floating. The only alternative is delivery by the abdominal route that is by lower segment Cæsarean section.

We should like to emphasise that a lower segment Cæsarean section is not a commonly used method of completing labour when the woman has been submitted to test labour but it is sometimes a necessity and must be adopted to save the foetus. The increased risks of an operation after the woman has been subjected to several hours of labour with probably more than one vaginal examination are obvious when compared with elective Cæsarean section. The impression should not be that a test labour has succeeded because a child has been born alive by a lower segment section done at a late stage of labour. If the obstetrician would therefore keep in view the limitations under which test labour can be conducted if he realises that it is not a method of treatment to be adopted for every case of contracted pelvis in the vain hope that somehow or other the head may eventually go through or alternatively that he may be able to deliver it at a later stage by a lower segment Cæsarean section test labour will be found to be remarkably useful and will save women from unnecessary and too frequent resort to abdominal methods of delivery. We are convinced of the great possibilities of test labour in the majority of cases of border line disproportions. We only sound a note of warning against its indiscriminate use without a full realisation of its risks and limitations.

Induction of Labour

Induction of premature labour as a method of treatment in cases of contracted pelvis was in vogue to a much larger extent a couple of decades ago. In fact the older text books on midwifery described this method in detail and framed rules as to the period of gestation at which induction should be attempted when dealing with different degrees of contracted pelvis. A wider experience and a more correct appreciation of the limitations of this method of treatment and of the possibilities of other methods of delivery in such cases have greatly narrowed the indications for induction of premature labour.

If used at all induction should be performed at a stage when the child is not merely viable but is capable of (a) withstanding the pressure in its passage through the genital passage and being born alive and (b) of continuing to live after delivery. It has now been definitely admitted that induction as a method of saving the foetal life is unjustifiable before the 34th week of pregnancy and indeed should be done preferably at the 36th week or even

later The advantages claimed are that at this period of pregnancy the head is relatively smaller and softer than at full term and can therefore mould to a greater degree and thus overcome the minor degrees of disproportions in border line cases of contracted pelves On the other hand it must be admitted that there are difficulties associated with induction of labour These are —

(1) It is difficult to ascertain exactly the period of pregnancy, and in many cases it is the experience of most obstetricians that even with the data furnished by the patient differences of a fortnight are not uncommon in calculating the exact date of the onset of labour *A fortiori* the same margin of error must be accepted in regard to the probable date of induction of labour

(2) Induction of labour is a method of treatment in border line cases and it is just in these cases that it is difficult to ascertain before the patient is actually in labour the extent of disproportion present and the probability of the head coming through with moulding and strong uterine contractions

(3) It must be accepted that at the 34th or 36th week compaction of the foetal ovoid is not perfect particularly is flexion of the head incomplete and under such circumstances by whatever method one may try to elicit the amount of relative disproportion the error resulting from the deflexed attitude of the foetal head will vitiate the judgment

(4) Particularly in a tropical country where the average weight of the foetus is one pound less than the average weight of the European child and where the chances of survival are less owing to various factors peculiar to a tropical climate causing an increased neonatal mortality the necessity for optimum conditions at birth is so obvious that one should hesitate before inducing premature labour for the sake of the foetus

For these reasons we have for some time restricted the practice of induction of premature labour Our results have been more satisfactory since we have allowed these patients to go to term and then given them a trial labour and employed such methods of artificial assistance as might be found necessary

In cases however where induction of premature labour is decided upon as a method of treatment it should be attempted only after the 34th week It is important to know exactly when such induction of labour should be attempted and for this purpose the foetus should present by the cephalic pole if it is not a cephalic presentation external version should be performed to convert it into one After the 34th week periodic abdominal palpation should be done at short intervals and with the second pelvic grip the extent of overriding of the head over the symphysis pubis should be estimated An assistant keeps the fundus of the uterus firmly pressed down while the operator by means of the second

pelvic grip grasps the head and tries to push it down into the brim while at the same time with the thumb of the right hand he estimates the amount of overriding of the head over the symphysis pubis. The proper time for induction of labour is when the head just shows a slight degree of overriding because at this stage if induction is performed the increased flexion of the head and the moulding resulting from uterine contractions will overcome this slight degree of overriding and allow the head to pass through the pelvic canal.

Munro-Kerr-Müller Method Another method of estimating the probable date when induction should be attempted is by using

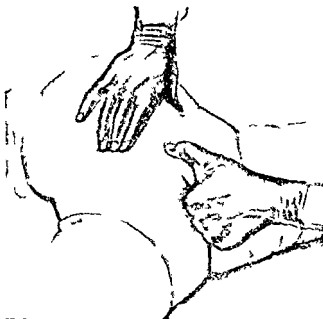


FIG. 153.—Munro Kerr Müller method of estimation of disproportion.

the Munro Kerr Müller method. Munro Kerr describes his method as follows —

“It is a bimanual method—the external hand pushes the head into the pelvis while the internal fingers of the other hand estimate the relative size of the pelvis to the head. It may be employed with or without anaesthesia but greater accuracy is obtained if the woman is anaesthetised. The patient is placed in the ordinary position for a gynaecological examination and the accoucheur stands at her side facing her. The right hand seizes the head and presses it into the superior strait, two fingers of the left hand are passed into the vagina these determine the consistency and manner of engagement of the head. Further information is obtained by utilising

is used. During the course of a test labour however conditions may arise which necessitate the application of forceps for the following reasons —

(1) The uterine contractions which are responsible for the delivery of the foetus may not be sufficient to complete the labour or a degree of inertia may develop in such cases, & *vis a fronte* is needed to aid the *vis a tergo* of the uterine contractions and forceps may be most useful.

(2) Occasionally before spontaneous delivery can occur the condition of the foetus may give rise to anxiety. Signs of foetal distress may manifest themselves either because of the prolonged labour or the greater degree of compression of the head in the pelvis or in some cases due to the strong uterine contractions. In such cases where the greatest diameter of the head has passed through the brim, forceps is of considerable value in completing delivery.

The forceps should never be considered as a method of compressing the head or of dragging it forcibly past the obstruction. In such cases not only is the foetus fatally injured but serious damage may be done to the maternal parts.

The terms high forceps and floating forceps are fortunately much less in use to-day and it should be clearly realised that such methods of delivery when the head is still above the brim are absolutely contraindicated.

(3) Occasionally the forceps may be indicated in cases of occipito posterior presentation complicating a border line case of contracted pelvis. rotation and traction are required to supplement the efforts of the uterus and in such cases forceps may be of great value.

(4) The forceps may be applied along with other methods of treatment of cases of contracted pelvis described later such as pubiotomy.

Version

The place of version in the treatment of contracted pelvis has been the subject of considerable discussion among obstetricians. Under certain circumstances it has a valuable place.

Version is sometimes indicated when a woman is in labour and the cervix well dilated but the head is still freely movable above the brim of the pelvis. Occasionally in border line cases of flat pelvis podalic version may be performed because of the fact that the wedge shape of the after coming head may pass through more easily than a fore coming head.

Version is particularly indicated in multiparae where slight degrees of disproportion exist. This disproportion may not necessarily be due to a contraction of the pelvis but may be brought

about by deflexion attitudes of the cephalic pole, resulting in non fixation of the head even when the woman has been in labour for some hours and the membranes have ruptured after full dilatation of the cervix. We have found in such cases that it is the safest method of delivery both in the interests of the mother and the fetus. The alternative of a high forceps is not to be thought of in view of the risks already mentioned, and if, as occasionally happens the strong uterine contractions bring about conditions indicating foetal distress, there is no other method which affords a safer readier and easier mode of delivery than internal podalic version and extraction. With experience the technique of the operation can be perfected but certain essential conditions should be borne in mind in performing version and extraction, which are referred to in the chapter on version.

diameter at the outlet, and consequently if the head is pulled through the outlet, with the woman in Walcher's position, a greater amount of resistance will be encountered and occasionally the sacro coccygeal joint may be dislocated

Exaggerated Lithotomy Position Here the woman is placed in the dorsal position and the thighs are acutely flexed towards the abdomen, so that the symphysis pubis is carried forwards and upwards. In consequence thereof the anteroposterior diameter of the outlet is increased. This posture is therefore adopted in cases of funnel shaped pelvis where the outlet is contracted in the anteroposterior diameter

Enlargement of the Bony Pelvis

Enlargement of the pelvic cavity may be effected by cutting through the pelvic girdle. This may be done by one of two methods —

- (a) By incising the symphysial joint, or
- (b) By sawing through the body of the pubis to one side of the symphysial joint

Symphysiotomy, as the former operation is called, and *pubiotomy* or *heboiotomy*, as the latter is named, have been performed for some time and have been both praised and condemned. It may be stated that at present few operators resort to symphysiotomy, but pubiotomy, as a method of treatment in some cases of contracted pelvis, still claims its adherents. The object of this operation is to increase the diameters of the pelvic cavity, so that in certain border line cases of disproportion the increased diameter will be sufficient for the safe passage of the head.

It has been claimed that prophylactic pubiotomy may be done with a view to secure a permanent increase in the capacity of the pelvis and thus allow labour to be completed uneventfully at term. If pubiotomy is to be performed in border line cases of contracted pelvis, we fail to see how one can decide upon its necessity and perform a prophylactic pubiotomy some weeks before the onset of labour, unless it be in those exceptional cases where the woman has had one trial labour and the obstetrician is fully aware of the diameters of the pelvis with which he is dealing. Even in such cases, we believe, experience shows that in subsequent pregnancies it is not safe to prophesy the course of labour. We are therefore of opinion that prophylactic pubiotomy only exposes the woman to an unnecessary operation and in doing so the obstetrician just misses the essential factor in pubiotomy, namely, the nicety of judgment which is required to decide about its necessity or otherwise at a particular stage of labour.

We deal with the details of these two operations, their indications, contraindications and scope, in a later chapter.

Abdominal Modes of Delivery

There are five methods of abdominal delivery which may be adopted in cases of contracted pelvis :—

- (1) Classical or elective Cæsarean section
- (2) Lower segment Cæsarean or laparo trachelotomy.
- (3) Extraperitoneal Cæsarean or Latzko's operation.
- (4) Cæsarean hysterectomy (Porro's operation)
- (5) Porte's operation or exteriorisation of uterus.

Indications. The indications for abdominal methods of delivery in contracted pelvis are :—

- (1) When the pelvis is so contracted that there is no possibility of delivering even a dead foetus through the vaginal route.
- (2) When the contraction of the pelvis is such that a live foetus cannot be delivered through the vaginal route.

The particular mode of delivery will depend upon several factors.

The classical or elective Cæsarean section is generally performed in cases where the woman has been under observation during pregnancy, and a careful consideration of all factors has indicated the necessity for delivering by the abdominal route at term. It is performed at term or early in labour, when the patient has had no opportunity of becoming infected and her general condition is good.

The lower segment Cæsarean or laparo-trachelotomy has, in some cases, supplanted the classical operation. DeLee goes so far as to say that laparo-trachelotomy should replace the old classical Cæsarean in all but a few exceptional cases, such as inaccessibility to the parts from pendulous belly, kyphoscoliosis, etc., and where instant delivery is required to save the child, and even here a very low classical section should be done.

Its main indication is in those cases of test labour where the woman has been some hours in labour, the membranes having ruptured, and it has been realised that the disproportion is such as to warrant delivery by the abdominal route. It may also be performed in "suspect" cases where the woman has been examined *per vaginam* and is possibly infected. It must, however, be realised that a lower segment Cæsarean section is not a method of delivery to be undertaken lightly when modes of vaginal conjugate have failed, or when the woman is seen late in labour.

after frequent vaginal examinations have been made and in an exhausted condition following prolonged labour with probable intrapartum infection. The risks incidental to the operation so far as the mother is concerned are so great that one is not justified in undertaking a lower segment section in cases of delayed or neglected labour. Even the chances of survival of the foetus after abdominal delivery are not very high and under such circumstances particularly if operative methods of delivery by

Management of Labour in Different Degrees of Contracted Pelves

It is customary for most obstetricians to classify the different degrees of contracted pelvis into four types as a rough guide for the proper method to be adopted. It need hardly be emphasised that these are only aids in making decisions, and that treatment cannot be laid down on the principle of arithmetic proportions. Various factors have got to be taken into account, such as the relative disproportion of the head, the degree of moulding possible, the force of uterine contractions, the attitude of the fetus especially in regard to flexion of the cephalic pole, the presentation and the presence or absence of other complications. One must emphasise that the principles of treatment do not depend upon any one factor but on a consideration of all facts in each case.

Bearing these general principles in mind it is, however, useful to adopt the classification into four degrees and to discuss the principles of treatment suited for each one of them.

The classification is based upon the length of the true conjugate, and whether one is dealing with a generally contracted or a flat pelvis—these two being the most common forms met with.

Length of the True Conjugate in— *Generally Contracted Pelvis* *Flat Pelvis*

First Degree	4 to 3½ ins (10 to 8.75 cm)	4 to 3½ ins. (10 to 8.1 cm)
Second Degree	3½ to 3 ins (8.75 to 7.5 cm)	3½ to 2½ ins (8.1 to 6.8 cm)
Third Degree	3 to 2½ ins. (7.5 to 6.25 cm)	2½ to 2 ins (6.8 to 5.6 cm)
Fourth Degree	Less than 2½ ins (Less than 6.25 cm)	Less than 2½ ins (Less than 5.6 cm)

Fourth Degree. Let us deal with the last type, the fourth degree of contracted pelvis, first. These are the extreme degrees, where the line of treatment can be definitely laid down. There is no possibility of a live child coming through the natural passages, nor is there any possibility of a dead child being delivered through the natural passages, even after mutilating operations. This fact must be clearly borne in mind, so that when a woman presents this type of contracted pelvis no difficulty arises in coming to a conclusion what mode of delivery is to be adopted. We have already stated that we do not advocate therapeutic abortion for such cases, and therefore do not consider it if the woman presents herself in the early months of pregnancy. Elective Cæsarean section at term is the only method of delivery to be thought of, and it ought to give exceedingly satisfactory results both for the mother and child.

It is perhaps not so clearly realised that the only mode of delivery is by the abdominal route even if the woman is seen at a late stage of labour no matter whether the child be dead or alive.

What the particular method of abdominal delivery should be is a matter for consideration. If the patient comes early in labour and has not been subjected to internal examinations previously either a classical or a lower segment Cæsarean section should be performed. The experienced obstetrician would prefer the lower segment section but to the less experienced we would advise the classical method. Should however the patient seek assistance when she has been actually in labour for some hours and has been examined vaginally it is safer to perform a lower segment Cæsarean section (laparo trachelotomy). It is just in these types of cases that lower segment section gives gratifying results but at the same time it is well to realise the limitations of this operation. Sufficient emphasis cannot be laid on the fact that the lower segment section is not the last resort of a desperate obstetrician who has tried all other modes of delivery. Where a case is obviously infected and has been subjected to frequent vaginal examinations or where ineffective attempts at delivery have been made the lower segment Cæsarean is not without serious risk to the mother. In such cases the only method of saving the fetus and improving the prognosis for the mother is the performance of a Cæsarean hysterectomy.

Another method of treatment through the abdominal route which may occasionally be adopted is the extraperitoneal (Latzko's) operation. This may be done in cases when the woman has been in labour for some time and it is feared that intra uterine infection might have taken place. The great advantage of this operation is that the peritoneal cavity is saved from infection. But it ought to be realised that even here uterine infection may persist. Hence hysterectomy in some cases may be desirable.

Having dealt with the extreme degree of contracted pelvis we may now deal with the other three degrees *seriatim*.

First Degree (conjugate vera 4 to $3\frac{1}{2}$ ins. in generally contracted and 4 to $3\frac{1}{2}$ in flat pelvis). In a large number of these cases provided sufficient time is given the head will mould through and be delivered spontaneously without risk to the mother or child. Occasionally help with forceps may be necessary particularly if the case is complicated with an occipito posterior position or weak uterine contractions. Care must be taken to see that forceps is not applied till the greatest diameter of the head has passed through the brim of the pelvis.

An alternative method of treatment particularly in flat pelvis is prophylactic podalic version. It is generally stated that this operation should not be done in a primipara but our own experience

leads us to the conclusion that in suitable cases where the head is above the brim it is still a safe method to be employed

Postural methods of treatment may occasionally be helpful in these border line cases. Walcher's position increases the true conjugate particularly in the flat type and helps the descent of the head and can be utilised either in the first and second stages or before actual delivery is effected with the aid of forceps

Occasionally often due to some miscalculation the degree of obstruction may turn out to be greater than was anticipated. Taking due precautions pubiotomy may be the wise choice and is an operation that will be found useful in selected cases

Ordinarily a Cesarean section is not indicated in this border line type of contracted pelvis but occasionally conditions may necessitate this operation as in cases of doubt where a trial labour has failed or because of errors in judgment or because of other complications during the course of labour. The choice between the classical and the lower segment Cesarean and the place of each in the treatment of contracted pelvis has been referred to already and is considered at greater length later

Second Degree (true conjugate $3\frac{1}{2}$ to 3 ins in generally contracted and $3\frac{1}{2}$ to $2\frac{3}{4}$ ins in flat type) Here the pelvis is definitely contracted and will not allow of the safe passage of a full term live foetus and in such cases Cesarean section at term is the operation of choice. The alternative method of delivery is induction of premature labour. This is a method attended with risks to the child and cannot therefore be considered as the best. In some cases a test labour may yet be allowed because it is surprising how a head which at the onset of labour appeared to be too big to pass through the pelvis may sometimes mould through and be delivered easily. But if test labour is allowed strict aseptic precautions should be taken and when the test has not been found successful a lower segment Cesarean section should be performed. Such cases require constant and careful watching during the course of labour

Third Degree (true conjugate 3 to $2\frac{1}{2}$ ins in generally contracted and $2\frac{1}{2}$ to $2\frac{1}{4}$ ins in flat type) It is impossible for a full term child to pass through such a pelvis and occasionally even a premature foetus cannot be delivered alive. Cesarean section offers the only method of delivery of a live foetus and even when the foetus is dead we consider it safer to do a Cesarean section in the interests of the mother than the mutilating operations necessary to extract a dead child. Wherever therefore the patient is seen sufficiently early in labour Cesarean section is the method of choice. If however the foetus is dead craniotomy may be done. Care must be taken before performing craniotomy to see that it is possible for the foetus to be extracted with the diminished size

of the head. It has been suggested that if the head does not descend other crushing operations may be adopted such as cephalotripsy and basilectomy. We have referred to these operations elsewhere and would state that in our opinion the prolonged manipulations necessary and the chances of injury to the maternal soft parts render these procedures more risky for the mother than the alternative of a Cæsarean section with if required, hysterectomy.

Caldwell and Moloy's Classification

Caldwell and Moloy from observations on the dry pelvis and roentgenologic examination of the living subject have classified the variations in the female pelvis into five different groups —

(1) The Gynæcoid Type. This is normal and possesses the characteristic features of the female pelvis. The group is subdivided according to variations in the size of the subpubic angle into pelvises—

- (a) with a narrow outlet
- (b) with a moderate outlet
- (c) with a wide outlet
- (d) large or small

(2) The Android Type. This type approximates to the male pelvis particularly in the posterior segment of the inlet and the extreme forms of this type of pelvis simulate the average male pelvis and may present the same four variations as in the gynæcoid type.

(3) The Anthropoid Type. This pelvis is said to resemble the pelvis of the anthropoid apes.

(4) The Platypelloid Type. Here the pelvis is broad and flat. This is a very rare type.

(5) Asymmetrical pelvis.

Caldwell and Moloy have discussed the obstetric significance of the different types of pelvis stated above.

The Gynæcoid Type. The small generally contracted form of pelvis in this type is really of obstetric significance. Such a pelvis usually occurs in women of small stature and as the fœtus is also relatively small occasionally engagement of the head occurs and delivery is effected by the vaginal route. If the child fails to engage the cephalopelvic disproportion is obvious and a Cæsarean section is the operation of choice.

The Android Type. This is the most dangerous type of pelvis from the obstetric point of view. If the head engages in the transverse diameter of the pelvic brim the prominent sacrum and narrow posterior pelvis force it forward into the narrowed anterior

portion Here the pelvis being more of the funnel shaped variety, owing to the general convergence of the four walls of the pelvis towards the outlet the head meets with increasing resistance as it descends In the larger forms of this type mid pelvic arrest occurs where forceps is difficult to apply and version and breech extraction equally dangerous If the extreme types are identified before the onset of labour elective Cæsarean section is the safest procedure to adopt

The Anthropoid Type In this type the anteroposterior diameter of the inlet is long and the transverse diameter relatively narrow The promontory of the sacrum is high the sacrosciatic notch is broad but shallow and the symphysis deep and wide Depending upon the degree of contraction of the transverse diameter of the superior strait the foetal head of average size may not engage in the transverse diameter and will be found floating above the brim at term Engagement is possible only in the anteroposterior diameter and if the child is small it may come through The head tends to be arrested in the narrowed transverse diameter especially if it has entered it In the extreme forms particularly when narrowing of the subpubic angle exists the head fails to engage and a Cæsarean section becomes the only safe method of delivery

Platypelloid Type Here the foetal head must engage in the transverse diameter of the pelvic inlet Unless the subpubic angle is narrow the transverse diameter is the longest diameter throughout the pelvis The head should be allowed to descend in this diameter to the pelvic floor If assistance by forceps becomes necessary rotation must not be attempted until the head has descended sufficiently and is low down near the outlet Two possible injuries may result in the course of the delivery if the long diameter of the foetal head does not descend in the transverse diameter but is forced into the anteroposterior diameter viz serious intracranial injury to the child or separation of the symphysis

CHAPTER XL

SPECIAL FORMS OF CONTRACTED PELVIS

Generally Contracted Pelvis

*(Also known as pelvis aequiliter justo minor,
or small round pelvis)*

In this type of pelvis all the diameters are proportionately contracted There is no associated deformity of the pelvis

The ætiology is not definitely known In some races a greater proportion of such pelvis may be met with than in others W

have already referred to the fact that the pelvis in certain races and communities is normally smaller than in others

The generally contracted pelvis can be diagnosed by pelvimetry, when it will be noted that all the external measurements are considerably but uniformly shortened. On internal examination the reduction of the diameters in all the planes of the pelvis will be easily made out.

Mechanism of Labour. In cases of vertex presentation in generally contracted pelvis the mechanism does not differ materially from that in a normal pelvis. Two factors, however, have to be considered, namely, the increased flexion of the head and the extreme degree of moulding. The increased resistance offered to the head increases the flexion and the head invariably enters in one or other of the oblique diameters. Owing to increased flexion the posterior fontanelle can be reached with extreme ease by vaginal examination. If there is no serious cephalo pelvic disproportion the mechanism may proceed uneventfully, internal anterior rotation taking place in the mid pelvis, and with further descent the occiput impinges underneath the symphysis pubis, and the head begins to disengage itself from the outlet of the pelvis by a movement of extension. The next movement in the mechanism after restitution is external rotation, and the rest of the delivery takes place in the usual manner.

Marked moulding of the head, with overlapping of the cranial bones is noticed, and this helps to decrease the size of the foetal head considerably and allow of its passage through the contracted pelvis.

Prognosis Labour may be considerably delayed, and occasionally the uterine contractions may be ineffective, necessitating artificial assistance to effect delivery. The prolonged pressure of the head may sometimes lead to troublesome complications such as sloughing of the cervix or the vaginal walls with the later formation of fistulae. The prolonged pressure on the head with the increased moulding, may lead to intracranial stress resulting in hæmorrhages, the prolongation of the stages of labour and perhaps the necessity for repeated examinations, entail increased risks of sepsis.

Treatment The general principles of management of labour have already been referred to, and the treatment depends upon the degree of pelvic contraction.

Dwarf Pelvis

(Also known as "*pelvis nana*")

This type of pelvis is associated with one or other of the different types of dwarfs and is an extreme degree of the generally contracted variety.

The treatment is obvious. Pregnancy must be allowed to go on to term, and there can be only one method of delivery, namely, Cæsarean section.

Generally Contracted Flat Pelvis

In this type of pelvis not only are the measurements all diminished but there is a disproportionate amount of diminution in the anteroposterior diameter, so that the difference between the intercrystal and the interspinous diameters is less than an inch. This type of pelvic contraction may occasionally be the result of rickets so that we may have the rachitic and the non rachitic forms of generally contracted flat pelvis.

The mechanism of labour partakes of the combination of the mechanisms in a generally contracted and in a flat pelvis. The head enters the brim of the pelvis with marked flexion, with the suboccipito bregmatic diameter in the transverse diameter of the pelvis. Asynclitism occurs usually, more often anterior asynclitism being present than posterior. Once the head passes through the brim of the pelvis the head may even become hyperflexed and the asynclitic deviation correct itself. With strong uterine contractions the head moulds, internal rotation occurs, and further delivery may take place in the usual manner.

Treatment. This type of pelvis, like the generally contracted, should be classified according to the degree of contraction and suitable treatment adopted. Labour is usually more prolonged than in the normal or even in either of the other varieties—generally contracted or flat pelvis. If test labour should not prove satisfactory a lower segment Cæsarean section may be required. In many cases provided sufficient time is given, the head will mould through, or only require assistance with forceps. Induction of labour before term is one of the methods advocated in such cases. Occasionally, and in very carefully selected cases, pubiotomy may yield good results. Cæsarean hysterectomy or craniotomy may be the other methods of delivery available, when the case is seen in the late stages of labour.

Flat Pelvis

In this type of contraction, which is one of the commonest met with, the anteroposterior diameter at the brim is shortened. It may be congenital in origin or, as in the large majority of cases acquired, the result of rickets. The diagnosis of this type of pelvis is fairly simple—the external measurements which show a lack of one inch of difference between the interspinous and intercrystal diameters, together with an internal examination which reveals undue protrusion of the sacral promontory, with shortening of the

diagonal conjugate usually suffice to establish the diagnosis of this type of contraction

Mechanism of Labour In a flat pelvis abnormalities of position and presentation are common. Owing to the protrusion of the sacral promontory the head does not enter the pelvis early but tends to slip to one side. Premature rupture of the membranes, prolapse of the cord and imperfect dilatation of the

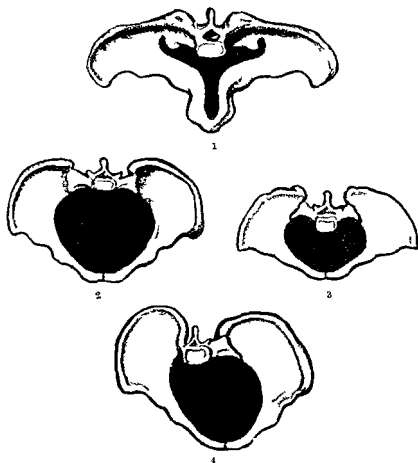


FIG. 154—Types of contracted pelvis

cervical canal, are therefore not infrequent. The head enters the brim of the pelvis but in view of the diminution in the size of the conjugate very early the head passes to one side. Engagement of the head takes place with the sagittal suture in the transverse diameter of the inlet; the head enters the pelvis in an attitude of slight deflexion; the bitemporal ($3\frac{1}{4}$ ins.) instead of the biparietal ($3\frac{3}{4}$ ins.) diameter engaging in the true conjugate of the inlet. As labour progresses the engagement of the head becomes *asynclitic*. By this is meant that the two parietal bones

do not descend together simultaneously so that one or other of the parietal bones is found leading. If the anterior parietal bone is leading anterior asynclitism is said to occur; if the posterior parietal bone is lower posterior asynclitism has resulted. Asynclitic engagement of the head is a feature of the mechanism of labour in a flat pelvis and is generally noticed with any degree

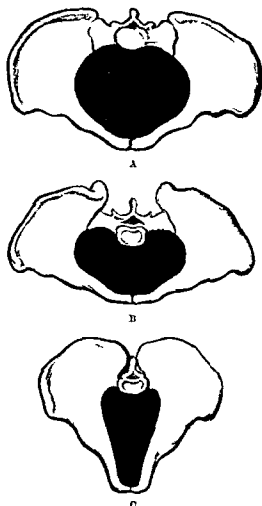


FIG. 133.—Types of contracted pelvis.

of flatness of the pelvis. On vaginal examination the sagittal suture may be noticed to be nearer the symphysis pubis or the sacral promontory according as the asynclitism is posterior or anterior. Anterior asynclitism or Naegele's obliquity is more favourable for the termination of labour than posterior asynclitism or Litzmann's obliquity. The reason for this is that when the anterior parietal bone is leading the posterior parietal bone has

got to encounter the resistance of the sacral promontory and with fairly strong uterine contractions as the resistance is only at a point the bone may slide past this point of obstruction. With posterior asynclitism on the other hand, the anterior parietal bone is prevented from progressing downwards by the surface of the symphysis pubis which is a fairly extensive area and as the bone has got to descend past the whole of the symphysis pubis the obstruction caused is much greater. With strong uterine contractions however the head may be driven into the cavity of the pelvis and after the parietal bones have passed through the superior strait synclitism recurs as the head has passed the seat of obstruction. The rest of the movement of increased flexion with descent internal rotation extension restitution and external rotation take their usual course.

In extreme degrees of flat pelvis the asynclitism may be so marked that the ear may be felt as the presenting part. In some cases as the posterior parietal bone passes the obstruction of the sacral promontory it may be flattened out or a large spoon shaped or funnel shaped depression may be found on it and occasionally even a fracture of the bone. In the lesser degrees of contraction a gutter shaped groove may be found running at right angles to the sagittal suture.

In the case of the after coming head the mechanism is somewhat similar to that described above. A point of some importance to remember is that the after coming head must pass the brim in the transverse diameter and that to effect delivery the head must be in a slightly deflexed attitude.

Treatment Treatment in this variety of contracted pelvis depends on the degree of contraction.

Prophylactic podalic version may be attempted in the slight degrees of contraction of the flat variety.

In some cases of moderate degrees of flat pelvis where the head is still above the brim of the pelvis after labour has been in progress for some time internal podalic version and extraction may be performed with satisfactory results to mother and child.

In the extreme degrees of contraction Cesarean section and in neglected cases Cesarean hysterectomy may be necessary.

Walcher's position and pubiotomy are two of the methods adopted in moderate degrees to increase the size of the pelvis. Craniotomy may be performed if the child is dead provided it can be delivered through the natural passages with safety to the mother.

Rarer Forms of Contracted Pelvis

Many varieties of the rarer forms of contracted pelvis are described, but from the obstetric point of view it may be stated that they are so infrequently met with that one may fail to come

across many of them even in a large practice. Some of the rarer forms met with are described below.

OBLIQUELY DISTORTED PELVIS

In this type there is a deviation of part or whole of the pelvis to one or other side so that there is a marked difference between the oblique diameters on the two sides.

This may be due to several factors the chief of which are

- (a) Congenital absence of one or other of the alæ of the sacrum. This is the typical *Naegele's* pelvis.

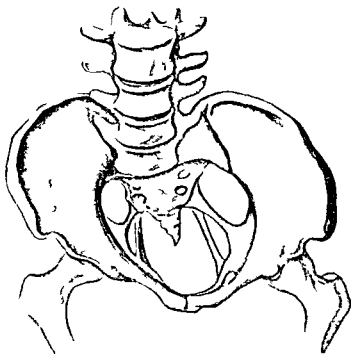


FIG. 106.—Obliquely contracted pelvis. *Naegele's*.

- (b) Due to spinal curvature (kyphoscoliosis) resulting in a lateral deviation and obliquity of the pelvic girdle (kyphoscoliotic pelvis).
- (c) Diseased conditions either of the sacro iliac synchondrosis or of the hip joint resulting in the tilting of the pelvis to one side (coxalgic pelvis).

(a) *Naegele's Pelvis*

This term is applied to those cases where the oblique distortion is due either to an absence or imperfect development of the sacral wing on one side. In the majority of cases this is a congenital defect. Occasionally the condition may be acquired as a result

of diseases such as tuberculosis of the sacro iliac joint or paralysis of one lower extremity in infancy resulting in the body weight being thrown on the sound leg

Clinical Characteristics The inlet is oval in shape the crests of the pelvis are markedly asymmetrical and the symphysis pubis is deflected from the median line to the unaffected side while the pubic arch is contracted and deflected. The external surface of the symphysis pubis faces the diseased side instead of directly forward the iliopectineal line of the affected side is almost a straight line while the ilium on the sound side has got a greater curvature in its anterior part than normal. Further on the affected side the posterior superior spine of the ilium approaches the sacral spine the sacro sciatic notch is shallow and small and the ischial tuberosity is nearer to the coccyx. The pelvic cavity is divisible into a narrow part towards which the sacral promontory points and a wider part bounded in front by the symphysis pubis.

Diagnosis When a routine pelvic examination is made the deformity is not likely to be overlooked. On internal examination the asymmetry will be easily recognised by the prominence of the ischial spines and the deflexion of the symphysis pubis. The existence of a scoliosis and the difference in the heights of the innominate bones or a difference in the distance between the posterior superior spine on either side to the spine of the last lumbar vertebra should suggest its presence. Naegele has suggested the following five measurements in such cases —

- (1) The distance from the tuber ischium of one side to the opposite posterior superior spine
- (2) From the anterior superior spine of one side to the opposite posterior superior spine
- (3) From the spine of the last lumbar vertebra to the anterior superior spine on either side
- (4) From the trochanter to the opposite posterior superior spine
- (5) From the lower margin of the symphysis pubis to the posterior superior spines on either side

Normally there should be no difference in these measurements when taken on either side but in a case of Naegele's pelvis there is generally a difference of 1 to 1.5 centimeters

(b) *Scoliotic Pelvis*

Scoliosis in the thoracic region produces a compensatory kyphosis in the lumbar region so that the pelvis itself is not generally affected in such cases. Where however scoliosis affects the lumbar region the pelvis may be seriously involved

Rickets is the commonest cause for this condition and other signs of rickets may be present. Such a pelvis is readily recognised by the presence of the spinal deformities together with the signs of obliquity of the pelvis.

(c) *Coxalgie Pelvis*

This type of oblique deformity is due to unequal lateral pressure due to an imperfect or abolished use of one limb. It may be caused by —

- (i) Tuberculous disease of the hip joint resulting in some degree of shortening of the limb
- (ii) Infantile paralysis (after acute anterior poliomyelitis)
- (iii) Dislocation of the hip joint congenital or acquired
- (iv) Talipes of one side
- (v) Amputation of one leg at an early age

The earlier the age at which any of these troubles arise and the more the leg is used on the sound side the more pronounced is the deformity.

The condition may be readily diagnosed by the characteristic gait and by pelvimetry.

Prognosis and Treatment The outlook is usually grave for both the mother and the foetus unless the condition is recognised early and suitable treatment adopted. The head of the foetus must pass through the oval of one side of the pelvis namely the healthy side of the pelvis as the contracted side is not large enough to admit any part of the foetus. In effect therefore this reduces itself to a labour in a severe degree of generally contracted pelvis and the mechanism is similar to that in a generally contracted pelvis. Should the degree of obliquity be great the delivery of a live child is impossible. In the majority of cases Cæsarean section is therefore the only method of treatment if the child is alive and the mother is in good condition.

Transversely Contracted Pelvis (Robert's Pelvis)

This is the rarest form of contracted pelvis. It is due to a failure of development of the sacral alæ on both sides resulting in synostosis on either side the sacro iliac synchondrosis being absent.

Characteristics The sacral alæ may either be absent or poorly developed. The sacrum is narrow the promontory is very much elevated and on internal examination felt prominently. The spines and tuberosities of the ischia are closely approximated. The transverse diameter of the pelvis is much diminished.

Diagnosis A careful pelvimetric examination with internal examination if necessary, makes the diagnosis obvious

Prognosis Unless suitable treatment is adopted at an early stage in labour, the prognosis is always bad for the fœtus and the maternal risks are also increased

Treatment Cesarean section offers the only satisfactory method of delivery in the interests of both mother and child. Within certain limits it may be possible to deliver a dead child after perforation and crushing. If however the contraction is pronounced the abdominal route should be adopted for the delivery irrespective of the condition of the fœtus

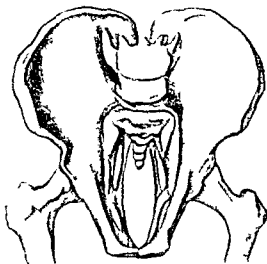


FIG. 13.—Robert's pelvis

Funnel-shaped Pelvis

In this variety the inlet may be slightly or not at all contracted but the lateral walls of the pelvis slope towards the median line and produce a progressively increasing contraction towards the outlet. The funnel shaped pelvis is a little more frequent than the other rare forms of contracted pelvis. The outlet may be contracted in a number of other varieties of contracted pelvis such as the spondylolisthetic osteomalacic and obliquely contracted pelvis

The typical funnel shaped pelvis however is one where the pelvis appears more or less normal if not actually bigger than normal at the inlet but contraction is present at the outlet and may also be noted in the cavity

Varieties The contraction of the outlet may be in one of two directions—anteroposterior or transverse. In the anteroposterior type the diameter which is relatively shortened is the distance

between the undersurface of the symphysis pubis and the tip of the coccyx. When the transverse diameter of the outlet is shortened a transversely contracted funnel shaped pelvis is said to exist.

Diagnosis The most certain method of spotting a funnel shaped pelvis is to make a routine pelvimetric examination of the outlet. If this is not done, the obstetrician will meet with surprises late in labour, when the head becomes stuck at the bony outlet and cannot be easily delivered.

Prognosis This depends upon the degree of contraction of the outlet its early recognition preferably antenatally, and the adoption of a suitable method of treatment.

Williams has clearly brought out the fact that when the transverse diameter is shortened in a funnel shaped pelvis there is a progressive narrowing of the pubic arch so that only a smaller segment of the head can possibly pass through it, and in the severer types that portion of the outlet posterior to a line joining the ischial tuberosities is the only portion available for its passage. Under such circumstances it is obvious that it is neither the transverse nor the anteroposterior diameters which can determine the possibility of the head passing through but rather the space available between the transverse diameter and the tip of the sacrum. This diameter is called the posterior sagittal diameter. Its measurement added to the transverse diameter of the outlet should make 6 ins. before a normal full term head can pass the outlet.

Treatment The appropriate treatment depends upon the degree of contraction of the outlet. In some cases where the pelvic contraction is not very great labour may end spontaneously. Occasionally help with forceps may be necessary. In minor degrees of contraction the exaggerated lithotomy position may be adopted to aid delivery of the head. This position as has been stated elsewhere helps to increase the anteroposterior diameter of the outlet and so allow the head to pass through, and is therefore more useful in its application to the anteroposteriorly contracted type of funnel shaped pelvis than in the other variety.

Occasionally pubiotomy offers the only possible means of delivering the fetus provided the contraction is not extreme. If the contraction is ascertained early in labour the question of a Cæsarean section should be considered depending on the degree of contraction. Where the fetus is dead craniotomy should be performed.

Spondylolisthetic Pelvis

In this deformity the last lumbar vertebra is dislocated and lies in front of the base of the sacrum so that the inferior surface comes in contact with and is united by bony union with the anterior

surface of the first piece of the sacrum. This produces a marked lordosis in the lumbar vertebrae, and the fourth third and occasionally the second lumbar vertebrae may overhang the pelvic inlet, causing obstruction in the anteroposterior diameter. The amount of obstruction at the inlet depends on the extent of the forward descent of the last lumbar vertebra and the degree of lordosis.

It is not clearly known what causes this condition. There may be two factors—a congenital factor and an acquired or traumatic factor.

The diagnosis is seldom difficult. There is marked lordosis in the lumbar region; the spine of the last lumbar vertebra is more



FIG. 158.—Sagittal section of a spondylolisthetic pelvis.

easily felt than normally. The transverse diameter of the pelvis is increased owing to the flaring of the iliac bones, and there is a contraction of the pelvic outlet. The true conjugate is diminished not on account of protrusion of the sacral promontory but owing to the last lumbar vertebra projecting forwards. The patient is generally short statured and the abdomen pendulous.

Prognosis. This depends upon the extent to which the pelvic cavity is encroached upon by the lumbar vertebra, so that the effect of this pelvis on labour is similar to that of the flat pelvis.

Treatment. It follows from what has been stated above that except in the very mild degrees, where the conjugate vera is only slightly shortened, the safest method of delivery is by the

abdominal route. In the milder cases forceps may be applied or occasionally version may be performed or craniotomy if the child is dead.

Pelvis Obiecta

This is a condition where owing to the presence of a marked lordosis in the lumbar region the lumbar vertebrae overhang the pelvic inlet. The condition is also known as *spondylisma*. In this condition the forward curvature of the lumbar vertebrae overhanging the pelvic inlet virtually produces a false brim through which the fetal head has to pass. The conjugate diameter being seriously lessened there is little possibility of labour terminating *per vaginam* and in most cases the safest method of delivery is by Cæsarean section.

Assimilation Pelvis

There may be three types of assimilation met with in the lumbosacro coccygeal region of the spine —

- (1) The last lumbar vertebra may be assimilated with the sacrum in which case the sacrum will have six segments instead of five and five foramina instead of four, while in the lumbar region there will be only four vertebrae.
- (2) The sacrum instead of consisting of five pieces which are in bony union with each other, may consist of only four pieces the first taking the characteristics of one of the lumbar vertebrae so that the lumbar portion of the spinal column will then consist of six bodies instead of five.
- (3) The coccyx may be assimilated with the last sacral vertebra.

The first type is known as the *high assimilation pelvis* the second as the *low assimilation pelvis* and the third as the *sacro-coccygeal assimilation*.

In the *high assimilation pelvis* there is a very high promontory, with a long sacrum, the concavity of which is markedly diminished so that the pelvic canal is deep and the conjugate vera lengthened while the transverse diameters are shortened. The outlet is contracted.

The other types of assimilation are very rare.

The management of labour in such cases will depend upon the extent to which the pelvic cavity is contracted in the antero-posterior and transverse diameters and in the majority of them elective Cæsarean section offers the safest method of delivery.

recur with increasing severity, till at last the patient is unable to move about freely, her stature becomes diminished and the labours tend to become more and more difficult. In no diseased condition may one meet with such extreme degrees of deformity of the pelvis as in osteomalacia. The promontory is pushed downwards and forwards, the pelvic walls on either side are pressed inwards so that the anterior wall of the pelvis near the symphysis is pushed out in the form of a beak and the brim assumes the characteristic triradiate shape. The pubic arch is very much narrowed on account of the approximation of the ischial tuberosities. The acetabula look forward and the legs are brought closer together.

The diagnosis of the deformity is not difficult. The history of the disease and the characteristic nature of the deformity with the beak shaped appearance of the anterior part of the pelvis cannot be mistaken.

Apart from the treatment of the disease so far as labour is concerned, Caesarean section offers the only possible way of delivering a live child. Occasionally it may be necessary to do a Caesarean hysterectomy in infected cases.

Pseudo-Malacosteon or Rickety Triradiate Pelvis. The deformity here is due to the occurrence of a very severe type of rickets in early childhood. The innominate bones yield to the pressure exerted on them and are bent laterally, while the sacrum is pressed downward and bent in the same direction. The deformity is usually far advanced before the disease is controlled and the pelvis becomes fixed in its distorted form.

Diagnosis. The nature of the pelvis and signs of rickets in other parts of the body with the history of infantile rickets make the diagnosis clear.

Treatment is the same so far as labour is concerned as that adopted in the osteomalacic variety.

Split Pelvis

This is a very rare type of pelvis and is due to a congenital anomaly namely failure of formation of the symphysis pubis so that the pubic bones lie apart the intervening area being filled by a fibrous band or by tissues. Almost invariably this condition is associated with *ectopia vesicae* and as imperfect development of the generative organs is not infrequent in such cases the condition is rarely met with in pregnant women.

In the one case which came under our observation delivery occurred at full term without any difficulty. An occasional complication is due to the possibility of infection of the urinary tract owing to the exposed position of the bladder and the ureters.

Primary Postpartum Hæmorrhage

This is due to atonic or traumatic causes, that is, lack of tonicity of the uterus after the delivery of the child, or lacerations of some part of the birth canal. The normal mechanism by which hæmorrhage from the placental site is controlled after delivery is regulated by three factors: (1) contraction of the uterus, (2) retraction of the uterus, and (3) clotting of the blood. Additional factors of less importance are (4) apposition of the anterior and posterior uterine walls, (5) constriction of the walls of the vessels passing to the placental site. When any one of these factors is disturbed active postpartum hæmorrhage is likely to occur.

Causes *Atonic postpartum hæmorrhage* may be due to:—

- (1) Lack of muscular tone of the uterus;
- (2) Retention of portions of the after-birth within the uterus;
- (3) Improper stimulation of the uterine musculature.

Conditions which may produce lack of tone of the uterine musculature are overstretching of the uterus due to hydramnios; twin pregnancy; excessively large size of the fœtus; fœtal monstrosities such as hydrocephalus, hydrothorax, ascites; concealed accidental hæmorrhage; tumours of the uterus, such as fibroids.

Loss of tone may also be due to chronic metritis, general malnutrition, or diseased conditions of the mother, such as anæmia, and as a result of chloroform anæsthesia, especially in prolonged labour.

Mismanagement of the third stage of labour is one of the chief factors responsible for the occurrence of postpartum hæmorrhage. Undue stimulation of the uterus immediately after delivery causes a partial separation of the placenta, and this leads to a severe degree of postpartum hæmorrhage.

Occasionally hæmorrhage may be the result of diseased conditions of the placenta which result in its partial adhesion to the uterine wall.

A distended bladder or a loaded rectum by favouring inertia of the uterus may cause postpartum hæmorrhage.

Displacements of the puerperal uterus backwards sometimes give rise to a severe form of both primary and secondary postpartum hæmorrhage.

Atonic forms of hæmorrhage may occur in cases of placenta prævia and ablatio placentæ, and even though the bleeding may not be severe, in some cases it may be quite sufficient to affect a patient adversely who has already been exsanguinated by antepartum loss.

Traumatic postpartum hæmorrhage is due to injury to the birth canal. It may be the result of operative methods of

delivery, such as the application of forceps or rapid extraction of the child before the cervical canal is fully dilated. Occasionally the birth of a large child may cause some degree of trauma and in some cases it may be due to impaction of the shoulders causing difficulty in their delivery with an excessive amount of stretching of the vaginal outlet.

The usual sites from which severe bleeding occurs in traumatic postpartum hæmorrhage are —

- (a) Cervical canal—tears extending to the broad ligament and occasionally even involving the lower uterine segment
- (b) Vagina—lacerations of the vagina particularly by the application of forceps in occipito posterior positions especially if the forceps slips
- (c) Clitoris—lacerations due to large size of the head or attempts to save the perineum by levering the head too much forwards
- (d) Perineum—lacerations of the perineum as a result of hurried delivery, as in breech extraction or in cases where the head slips out suddenly as in occipito posterior positions in forceps delivery or when a large head or an impacted shoulder is being delivered

The hæmorrhage in these cases is not severe unless lacerations of the cervical canal involving the broad ligament or extending to the lower uterine segment are present. Occasionally the hæmorrhage from a torn clitoris may be fairly severe because of injury to the artery to the clitoris.

Signs and Symptoms. In the majority of cases the hæmorrhage is external, but occasionally the uterus may become distended with large blood clots and rise to a considerable height above the umbilicus. The symptoms are general and local the former being characteristic of hæmorrhage in general namely pallor weakness dimness of vision small thready pulse tendency to syncope, cold perspiration restlessness and air hunger. The patient soon shows signs of anxiety, may develop nausea and vomiting and constantly tosses about from side to side and complains of severe thirst. In extreme cases she quickly sinks into a condition of syncope with shallow respiration and death may supervene.

Side by side with these symptoms it will be found on examination that the uterus is flabby, enlarged and full of blood clots or there may be a severe amount of external hæmorrhage evident. In some cases although the uterus is contracted external bleeding may still persist. In a few cases the uterus may not be easily palpable through the abdomen and in such cases generally backward

displacement of the uterus has occurred, the uterus lying posteriorly or occasionally partially in the pelvis and partially in the abdominal cavity against the sacral promontory and the spinal column. The kinking of the uterus in such a position leads not only to the retention of the blood-clots but favours atony, both by virtue of the retained clots as well as by its retroflexed position.

Prognosis The amount of hæmorrhage may vary within wide limits and the loss of blood may occur gradually or in a sudden gush. The prognosis depends upon the severity of the hæmorrhage and the underlying causative factors. Apart from the dangers of the hæmorrhage the prognosis is rendered serious on account of the possibilities of subsequent infection. If the case is treated promptly and adequately the prognosis is favourable.

Diagnosis Diagnosis presents little or no difficulty in the large majority of cases. Occasionally the hæmorrhage may be concealed, or at least mostly concealed, in which case the condition of the patient, in association with the increased size of the uterus, will indicate the true state of affairs. It is necessary to differentiate between the atonic form of postpartum hæmorrhage and the traumatic form —

Atonic Postpartum Hæmorrhage.

- 1 Generally occurs some little time after delivery
- 2 May occur in gushes and clots may be expressed
- 3 The uterus is flabby, lax and may be increased in size.

Traumatic Postpartum Hæmorrhage.

- Occurs immediately after delivery
- Is continuous and is more bright red in colour
- Uterus is generally firmly contracted and hard.

In traumatic hæmorrhage examination by a speculum will reveal the presence of lacerations at one or other of the different situations in the genital canal already mentioned.

We do not advocate the insertion of an intra uterine tube or the giving of an intra uterine douche for purposes of diagnosing whether the hæmorrhage is of the atonic or traumatic type, as we consider that this is attended with risks to the mother and is wholly unnecessary. Inspection of the after birth may also reveal the probable cause, for if portions of the placenta or membranes or a succenturiate lobe be missing, the likelihood of atonic hæmorrhage occurring is greater.

It must also be mentioned that in the majority of cases the two forms of hæmorrhage are combined as for instance after a forceps delivery it is common to have some degree of atonicity of the uterus in association with lacerations of some part of the birth canal.

Treatment Postpartum hæmorrhage is one of the emergencies of obstetric practice, and an essential condition for success in its treatment is a definite plan which can be followed without hesitation.

in a systematic manner. Nothing is calculated to defeat the very purpose of the treatment more than the hesitating policy sometimes adopted and the varying methods tried without giving any single line of treatment a chance of success.

A general principle that may be laid down is, that as far as possible the less interference there is either with the vagina or with the uterus the better; and if it is inevitable vaginal interference is preferable to intra uterine manipulations.

Prophylactic treatment should also be adopted in cases where there is the possibility of postpartum hæmorrhage occurring. Such types of cases are —

Cases with previous history of postpartum hæmorrhage

Multiparae particularly after the fourth confinement

Hydramnios twin pregnancy

All forms of antepartum hæmorrhage

Prolonged labour

Instrumental deliveries under general anaesthesia

In all patients suffering from anæmia and valvular disease of the heart

General exhausting illnesses

In such cases, delivery should never be hastened and artificial interference avoided as far as possible. The third stage should be conducted with extreme caution and as a precaution the delivery room should be fully equipped with everything necessary for the immediate treatment of postpartum hæmorrhage should it supervene. It may be desirable to increase the coagulability of blood by the administration of calcium salts and any measures taken to improve the general health of the patient will always be conducive to the prevention of postpartum hæmorrhage.

When postpartum hæmorrhage does occur our aim is to promote firm contraction and retraction of the uterus to control any bleeding from traumatic causes and to treat the patient for the accompanying hæmorrhagic collapse.

The condition of the uterus must be noted and whether or not the placenta has already been expelled. If the placenta is *in utero* the uterus must be gently kneaded to provoke contractions and if the placenta has separated it can be expressed by firmly compressing the fundal portion of the uterus and pushing it down wards and backwards in the axis of the brim of the pelvis. After the expulsion of the placenta the patient should be given $\frac{1}{2}$ to 1 c.c. pituitary extract and 20 minims of ergotin. The uterus should be controlled abdominally by the palm of the hand being inserted behind the fundus and thus grasping the fundus. In a large majority of cases this simple measure is sufficient to arrest hæmorrhage.

Where traumatic hæmorrhage is also present it may be treated in one of the following ways —

- (1) Suture of the lacerations
- (2) Hot vaginal douches
- (3) Plugging of the vagina

The most desirable method of dealing with traumatic hæmorrhage is to suture the lacerations thus arresting the hæmorrhage and at the same time repairing the damaged tissue

When the lacerations are slight and particularly if they are in the vagina the hæmorrhage is more from small vessels and can be controlled by means of a fairly hot vaginal douche—the temperature of the douche should be between 115 and 120° F

Plugging the vagina affords a ready means of checking hæmorrhage from irregular lacerations in the cervix or the vagina and can be resorted to in an emergency when facilities for repair by suture are not available Any lacerations of the perineum should be carefully sutured, not merely to prevent oozing of blood but also to ensure that the perineum is re formed and chances of sepsis are obviated

Once hæmorrhage is arrested or simultaneously with the arrest of hæmorrhage the patient should be treated for hæmorrhagic collapse The foot of the bed is raised, the patient is covered with blankets hot water bottles are applied, and saline is given either subcutaneously or intravenously A gum saline or blood transfusion may be necessary

If the placenta cannot be expressed and the bleeding still continues it is necessary to remove the placenta manually, taking all antiseptic precautions, and in such circumstances it is well to give the patient an anæsthetic to prevent the shock associated with intra uterine manipulation and to permit of passing the gloved hand through the cervical canal into the uterus The placenta is gradually separated from edge to edge and removed by gripping hold of a thick portion of it If the placenta is adherent considerable difficulty may be experienced and it may have to be removed piecemeal A final exploration of the uterine cavity to make certain that no bits of placenta are left behind is necessary in such cases After the removal of the placenta the same line of treatment as has been suggested above may be followed

If these measures are not successful the bleeding may be controlled by grasping the fundus of the uterus, pulling it up and with the thumb and the index and middle fingers of the other hand applied on either side just above the symphysis pubis gripping the lower segment of the uterus so as to compress the uterine arteries By such compression it is possible effectively to control the uterine arteries on either side so as to diminish the quantity

of blood that flows into the placental sinuses while the uterus is kneaded and provoked to contraction by the injection of ecbolics.

In some cases the hæmorrhage is sometimes alarming and the uterus cannot be palpated through the abdominal wall and in such cases the uterus may be found to be retroflexed. We have in these cases introduced a few sterile artificial sponges into the posterior fornix of the vagina and thus lifted the uterus up into the abdominal cavity so that it can be massaged and provoked to contract. This has helped in a very large measure to control postpartum hæmorrhage resulting from retrodisplacements of the recently delivered uterus. We do not advocate hot intra uterine douches, bimanual compression of the uterus or intra uterine plugging as we consider that they produce an amount of shock apart from the added risks of sepsis and in our experience they are not essential for the arrest of postpartum hæmorrhage.

A method of treatment that has sometimes been advocated is compression of the abdominal aorta either by the fist applied to the abdominal wall pressing the abdominal aorta against the spinal column or by means of a belt—Momburg's belt. Such methods of compression particularly by any tight bandage round the abdomen of the patient or by means of a belt is in our opinion contraindicated in the tropics where splenic enlargements due to various causes are not uncommon and the chance of rupturing such spleens is by no means remote.

Operative treatments for postpartum hæmorrhage have been advocated such as clamping the broad ligament ligating the uterine arteries or hysterectomy. As we have had no occasion to resort to any of these methods, we are not in a position to assess their true value. Such extraordinary measures must be rarely indicated and if the methods advocated above are followed should never be needed.

We next deal with postpartum hæmorrhage as it may sometimes present itself to the practitioner some hours after delivery. Occasionally patients are brought to an institution after delivery in their own homes in a condition of collapse due to hæmorrhage and with the placenta retained. The first point to be considered in such cases is whether hæmorrhage is still present or not. If it is not present and the condition of the patient is one of collapse the first essential is to treat her for the collapse and not to interfere with the placenta. Any attempt at vigorous expression of the placenta or at manual removal will increase the shock and predispose to a recurrence of hæmorrhage and immediate collapse. In these cases the external genitalia should be cleansed, the cord cut as close to the vulval outlet as possible, an antiseptic pad applied, the foot of the bed raised, the patient treated for the collapse and watched carefully for signs of any further hæmorrhage.

If there be no hæmorrhæe the patient can be left alone for twelve to twenty four hours till she rallies and then the placenta may be expressed or if it is partially adherent be removed manually.

Secondary Postpartum Hæmorrhage

The *causes* of secondary postpartum hæmorrhage may be either general or local.

Among the general causes are certain affections of the heart, lungs or liver—acute infectious diseases, toxæmias and mental emotion.

The chief local causes are retained fragments of placenta or membranes; retained blood-clot; a secondary or succenturiate placenta; secondary hæmorrhage from lacerations of the cervix, vagina or vulva; displaced thrombi; tumours of the uterus, such as fibromata, carcinomata and mucous polypi; or erosion of the cervix.

Symptoms. The hæmorrhage generally occurs some hours after delivery and gives rise to the same symptom as occur in primary postpartum hæmorrhage, the severity depending upon the amount of blood loss.

Treatment. This must vary with the cause as in primary hæmorrhage. The best treatment is preventive. The third stage of labour as well as the first few days of the puerperium should be properly managed. Retention of placental tissue or membranes or of blood-clots must be avoided as well as distention of the bladder or rectum. The patient should be kept quiet in bed till uterine involution is well advanced and exertion should be limited.

The curative treatment for this condition consists in ensuring that the uterus is completely emptied and that it properly contracts and retracts thereafter. A vaginal examination should be made and if the cervical canal is patulous and allows a finger to be introduced the uterine cavity may be explored and any retained material removed. If the cervix is not dilated and the hæmorrhage is profuse the cervical canal should be dilated and the interior of the uterus explored and all retained fragments removed. In these cases after evacuation of the uterus, if the bleeding does not stop a hot intra uterine douche at a temperature of 115° F may be given. The douche given at this stage will not cause the same degree of shock or tendency for separation of blood clots as when it is given immediately after delivery and so it is much less risky in secondary postpartum hæmorrhage than in cases of primary hæmorrhage. If the hæmorrhage is a result of old lacerations a hot douche followed by plugging of the vagina may be necessary.

General lines of recuperative treatment as for postpartum hæmorrhage should be adopted in such cases and the patient confined to bed for a fairly long time

Retained and Adherent Placenta

Sometimes the placenta is retained or morbidly adherent and may not be expelled after the delivery of the child. This condition is more frequent in premature labours than at full time deliveries.

Causes—Retained Placenta Normally the placenta is expelled within half to one hour after delivery in a primipara and in from fifteen to thirty minutes in a multipara. The placenta may however be retained for a longer period. Such retention may be due to —

(1) Inefficient contractions of the uterus in the third stage of labour

(2) Irregular uterine contractions generally caused by stimulating the uterus at too early a period after delivery or by the administration of ecbolics such as ergot

(3) Hour glass contraction of the uterus which may result from such irregular contraction

(4) Occasionally distension of the bladder or even a loaded rectum

Adherent Placenta Here the placenta is morbidly adherent either in whole or in part to the uterine wall. This may be caused by —

(1) Morbid adhesions as a result of decidual endometritis

(2) Inflammation of the placenta or infarcts of the placenta

(3) Anomalies of the placenta such as placenta succenturiata placenta membranacea and placenta accreta

Diagnosis The chief symptom of retained placenta is post partum hæmorrhage. The hæmorrhage may sometimes occur as a secondary hæmorrhage when a small portion of the placenta is retained or an accessory lobe as in a placenta succenturiata is left behind. The hæmorrhage in such cases usually occurs within the first week of the puerperium and is quickly followed by other attacks of bleeding. It may occur when the patient first gets out of bed. Other complications may also ensue as a consequence thereof. When however the placenta is retained immediately after delivery the condition is obvious.

In cases of adherent placenta the hæmorrhage is insignificant when the whole of the placenta is adherent as in the condition of placenta accreta or a completely adherent placenta. Usually however portions of the placenta become separated and from the exposed areas of the uterine wall a severe amount of postpartum hæmorrhage occurs.

General lines of recuperative treatment as for postpartum hæmorrhage should be adopted in such cases and the patient confined to bed for a fairly long time

Retained and Adherent Placenta

Sometimes the placenta is retained or morbidly adherent and may not be expelled after the delivery of the child. This condition is more frequent in premature labours than at full time deliveries.

Causes—Retained Placenta Normally the placenta is expelled within half to one hour after delivery in a primipara and in from fifteen to thirty minutes in a multipara. The placenta may however, be retained for a longer period. Such retention may be due to —

(1) Inefficient contractions of the uterus in the third stage of labour

(2) Irregular uterine contractions generally caused by stimulating the uterus at too early a period after delivery or by the administration of echolics such as ergot

(3) Hour glass contraction of the uterus which may result from such irregular contraction

(4) Occasionally distension of the bladder or even a loaded rectum

Adherent Placenta Here the placenta is morbidly adherent either in whole or in part to the uterine wall. This may be caused by —

(1) Morbid adhesions as a result of decidual endometritis

(2) Inflammation of the placenta or infarcts of the placenta

(3) Anomalies of the placenta such as placenta succenturiata placenta membranacea and placenta accreta

Diagnosis The chief symptom of retained placenta is post partum hæmorrhage. The hæmorrhage may sometimes occur as a secondary hæmorrhage when a small portion of the placenta is retained or an accessory lobe as in a placenta succenturiata is left behind. The hæmorrhage in such cases usually occurs within the first week of the puerperium and is quickly followed by other attacks of bleeding. It may occur when the patient first gets out of bed. Other complications may also ensue as a consequence thereof. When however the placenta is retained immediately after delivery the condition is obvious.

In cases of adherent placenta the hæmorrhage is insignificant when the whole of the placenta is adherent as in the condition placenta accreta or a completely adherent placenta. Usually however portions of the placenta become separated and from exposed areas of the uterine wall a severe amount of post hæmorrhage occurs.

Treatment—Retained Placenta If the placenta is retained after delivery and is not expelled within the usual period of fifteen to sixty minutes in the absence of any hæmorrhage it may be left alone for a couple of hours.

The treatment depends upon the condition of the patient the presence or absence of hæmorrhage the extent of hæmorrhage the presence of hour glass contraction—and whether the placenta is morbidly adherent or not. We shall deal with each of the conditions that may be met with in detail.

(1) *Retained Placenta without any Hæmorrhage occurring after Delivery* In such cases if the general condition of the patient is satisfactory the placenta may be left alone for a couple of hours after which it may be expressed by massaging the uterus, provoking it to contract and then compressing the uterine fundus and gently squeezing it in the direction of the axis of the brim of the pelvis. In such cases the placenta has probably separated but is lying in the lower uterine segment and as the contractions of the uterus are ineffective to expel it it has got to be expelled out by the method which is commonly associated with the name of Crede and spoken of as Crede's manœuvre.

(2) *If the placenta is retained and there is severe hæmorrhage* the uterus must be massaged and compressed to expel all blood clots and occasionally the hæmorrhage may stop. In such cases time may be given for the placenta to separate and later expulsion of the placenta facilitated by Crede's manœuvre. If however the hæmorrhage is persistent and the placenta cannot be expressed it is not wise to allow the bleeding to continue as it will impair the general condition of the patient. Manual removal of the placenta is attended with risks particularly the risk of sepsis but if it is necessary it had much better be done before the patient has lost much blood and when she can better stand the intra uterine manipulations. We have often seen this operation postponed for fear of sepsis with the result that when finally undertaken it has increased the shock and the collapse and has during the puerperium increased the risk of sepsis because of the anæmic condition of the patient. When therefore the placenta cannot be expressed and hæmorrhage is severe and cannot be controlled with due antiseptic precautions and after cleaning the vulva and the vaginal outlet the gloved hand is introduced under anæsthesia into the uterine cavity and the placenta gently separated from one side to the other and removed. After removal of the placenta the uterus must be massaged and kept contracted with injections of pituitary extract and ergot preparations while other methods of treatment otherwise under postpartum hæmorrhage for collapse should be instituted. *old* 14 *If the patient is seen for the first time with retained placenta* may be condition of collapse but there is no hæmorrhage at the

The condition is usually discovered when the hand is passed into the uterus to remove the placenta because of severe hæmorrhage

In the absence of bleeding time may be given for the spasm to pass off, and an anæsthetic may be necessary to relieve it. If, however, hæmorrhage is present the patient should be anæsthetised. The hand is introduced with care the fingers are inserted into the constriction ring and gradually dilated while the other hand steadies the fundus of the uterus. Thereafter the placenta is removed



the normal uterine contractions fail to expel it and hæmorrhage still persists. In some cases there is a previous warning history of morbid adhesions. Once the diagnosis is made it is advisable to remove the placenta unless the general condition of the patient contraindicates any uterine manipulation. Even in these circumstances if the hæmorrhage is persistent there is no alternative but to face the risk and remove the placenta. After removal of the placenta firm contractions of the uterus must be promoted by injections of pituitary extract and ergot preparations.

The question whether an intra uterine douche should be given in cases where manual removal of the placenta has been performed either for adhesions or for simple retention is a moot one. We are not in favour of an intra uterine douche but there are many obstetricians of experience who recommend this as an essential step in the treatment. If an intra uterine douche is given care should be taken to see that the fluid is a non irritating antiseptic at a temperature of 115 to 120° F. that it is given at a fairly low pressure that the return flow is maintained and that the uterus does not become overdistended with the fluid.

Retained or Adherent Membranes

Not infrequently a portion of membrane is left in the uterus and in some cases the whole chorion may be adherent. This may cause hæmorrhage and later lead to infection.

The diagnosis is usually made by a careful examination of the placenta and membranes after delivery.

Treatment. Small pieces of chorion retained do not require removal in the absence of any hæmorrhage and if the uterus is properly contracted. Injudicious attempts at removal by intra uterine manipulation may only favour sepsis. The fragments of membrane are generally discharged in the lochia, and if the condition is recognised care should be taken in the puerperium to favour expulsion of the membranes by administering ecboles or occasionally by hot vaginal douches. We have sometimes seen fairly large pieces of chorion being expelled on the third or fourth day with little or no complication of the puerperium.

Placenta Accreta or Increta

This is a very rare condition where the whole of the placenta is so morbidly adherent to the uterine wall because the villi have burrowed into the musculature. There is no decidua spongiosum. There is little postpartum hæmorrhage in such conditions and it is recognised only when an attempt is made at manual removal. Care must be taken to see that the uterus is not punctured or torn.

through in the attempt at removal. If the placenta is completely accreta it is much more desirable to perform a hysterectomy than make ineffective attempts at manual removal.

Sequelæ of Adherent or Retained Placenta

The following sequelæ may occur in this condition —

- (1) Puerperal infection
- (2) Subinvolution of the uterus
- (3) Secondary postpartum hæmorrhage
- (4) The formation of a placental polypus

Sepsis, the result of retained or adherent placenta, is usually due to infection from without, favoured by the lowered vitality of the patient resulting from hæmorrhage and the presence of the decomposing placental tissue. For these reasons strict aseptic and antiseptic care must be taken when removing the placenta manually.

Subinvolution of the uterus is not infrequent, partly on account of retention of some portion of the membranes or placenta, and partly due to the anæmic condition of the patient following postpartum hæmorrhage. In such cases involution is favoured by promoting free discharge of lochia by posture and ensuring uterine contraction. Hot vaginal douches, raising the head of the bed or adoption of the Fowler position, and the administration of ecboics such as ergot and quinine, are indicated. For the secondary signs of anæmia the patient should be treated with hæmatinics.

Secondary Postpartum Hæmorrhage. This condition is dealt with in the chapter on postpartum hæmorrhage.

Placental Polypus. This is one of the rare sequelæ of retention of small portions of placenta and particularly of a succenturiate lobe. A piece of placenta remains adherent to the uterine wall, and by the gradual deposition of blood clot over its surface it increases in size, and the uterus fails to involute completely. Contractions of the uterus gradually expel the placental polypus through the cervix, which remains patent.

The chief symptom is hæmorrhage which occurs at a rather late period of the puerperium. There may be a slight rise of temperature, sometimes the placental polypus may be retained in the uterus for weeks or even months, and this is associated with persistent and intractable metrorrhagia and an offensive dirty vaginal discharge.

The diagnosis is made from the history, increased size of the uterus, and the nature of the vaginal hæmorrhage.

Treatment consists in dilating the cervical canal and removing the polypus either with the fingers or with a blunt curette. The uterine cavity is douched out and contractions of the uterus favoured by the administration of ecbolics orally or by injection.

Puerperal Inversion of the Uterus

Inversion of the uterus, by which is meant the uterus being turned inside out, may occur immediately after delivery.

Ætiology The factors that favour inversion are —

- (1) Atony of the uterus
- (2) Improperly applied pressure over the fundus
- (3) Traction on the umbilical cord
- (4) Fundal implantation of the placenta

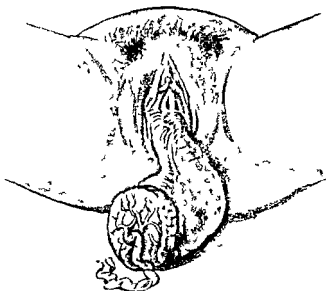


FIG. 161 — Complete inversion of uterus. The placenta is still adherent to the uterus.

Inversion is brought about either by pressure from above or by traction from below, in the presence of an atonic uterus and a soft dilated os. The condition that may favour pressure from above is excessive force used in the expression of the placenta, particularly during the period of relaxation of the uterus. Occasionally at the end of the second stage, forcible attempts to express the fœtus may cause a slight dimpling of the fundus which, together with the straining and subsequent uterine contractions may increase this dimpling and lead to inversion. In some cases faulty compression of the uterus, after expulsion of the placenta to arrest hæmorrhage or to express blood-clots, may similarly favour inversion. Traction on

the cord and so pulling on the placenta before complete separation and unskilful attempts at manual removal of the placenta may also cause inversion

Varieties Inversion of uterus may be of three degrees —

First Degree—There is a dimpling of the fundus which however still remains above the internal os

Second Degree—The fundus passes through the internal os

Third Degree—The uterus is completely turned inside out and lies partly outside the vulva

Symptoms Acute puerperal inversion of the uterus is one of the most serious of obstetric complications. Two symptoms dominate the clinical picture—shock and hæmorrhage. The hæmorrhage is sometimes of an intractable nature and not till the inversion is reduced can it be controlled. Where the inversion is complete the congested endometrium of the uterus with or without the placenta attached can be seen lying outside the vulva and is easily recognised.

Diagnosis The incomplete forms of inversion present more difficulties in diagnosis. In addition to the hæmorrhage and shock abdominal palpation shows the fundus to be absent or deficient with occasionally the presence of an actual dimple. Vaginal examination will reveal a soft globular swelling in the vagina or cervical canal which together with the fact that the fundus cannot be felt by abdominal palpation at once suggests the diagnosis.

Prognosis The prognosis of this condition is grave although with efficient help at hand to apply energetic treatment the mortality may be considerably reduced. The shock and collapse associated with inversion are out of all proportion to the hæmorrhagic loss. Death is due to shock, hæmorrhage or sepsis.

Prophylaxis In a serious condition such as this associated with a high mortality every effort should be made to prevent its occurrence by care in the conduct of the third stage of labour. This consists in strictly avoiding any traction on the cord or applying unskilful pressure to the fundus of the uterus and by

portion flops back into position once the greater part of the inverted uterus has been replaced. Due antiseptic precaution should be taken, the inverted exposed portion of the uterus should be thoroughly cleaned and washed with a mild antiseptic and then steady, firm pressure applied with the fingers. The other hand should be on the abdomen to support the uterus as it is being replaced. After reposition the fundus should be massaged carefully uterine contractions promoted and the patient treated for shock and collapse.

Should the placenta if attached to an inverted uterus be removed before reposition? This is a point on which opinions differ. The advantage of removing the placenta before reposition is that it is easily and thoroughly done under direct vision and the mass to be replaced is thereby reduced in size but the disadvantage is that a severe postpartum hæmorrhage may occur which cannot be controlled till the uterus has been reposed. If there is difficulty in reducing the inversion under such circumstances it necessarily follows that the patient runs a serious risk of collapse. *Per contra* while there may be some difficulty in removing the placenta after reposition the advantage claimed is that the uterus is much more under control if postpartum hæmorrhage should supervene. We are inclined to favour the view that it is preferable to remove the placenta after reposition of the inverted uterus.

Chronic Puerperal Inversion

In some cases inversion may not be recognised at the time of its occurrence or the patient may only be seen for the first time some days later. In such cases the patient suffers from repeated hæmorrhages and a slight rise of temperature. The endometrium being exposed presents a granular shaggy appearance due to the chronic congestion and infection particularly over the placental site. The condition is recognised on a vaginal examination which reveals the presence of a globular swelling with the soft thickened endometrium presenting a hyperæmic appearance when seen with a speculum.

Diagnosis The condition is very often confused with *prolapse of the uterus* or a *fibroid polypus*.

The globular nature of the mass with its velvety surface the absence of the external os at its lower end and the presence of the ring of the dilated cervical canal above the mass will help to differentiate the condition from prolapse of the uterus.

A fibroid polypus may easily be mistaken for inversion of the uterus but on bimanual examination the fundus of the uterus is palpable in its normal position. A careful vaginal examination with the finger introduced into the cervical canal if possible will

help to differentiate the condition. A fibroid polypus is harder and does not present the same soft velvety feel of an inverted uterus. If a uterine sound is passed the normal or increased length of the uterine cavity can be demonstrated together with the pedicle of the fibroid polypus whereas in the case of an inverted uterus the sound passes less than the normal distance.

Treatment. The immediate treatment is to attend to any sepsis present. The congestion of the endometrium may be relieved by hot vaginal douches and the application of mild antiseptics. When the endometrium has been cleaned an attempt may be made under an anæsthetic to replace the inverted uterus. If this proves unsuccessful it is much better to improve the general condition of the patient and to treat her for the hæmorrhage and chronic endometritis and only at the second or third month after delivery undertake an operation for the replacement of the inverted uterus.

The operation may either be by the vaginal route or the abdominal route. The classical operation described by Spinelli is done by the vaginal route. The technique of the operation is as follows. The vagina and the inverted uterus are carefully cleaned. The anterior fornix is incised and the bladder is separated from the uterus. The utero vesical peritoneal pouch is opened into and the inverted uterus exposed. The cervix is caught on either side of the median line by two volsella and is incised in the midline the incision being continued down the anterior wall of the inverted corpus uteri sufficiently low to allow the inversion of the uterus to be reduced. The uterus is then replaced by grasping the sides of the incision with the fingers of both hands and making pressure against the fundus with the thumbs. The incision in the uterus is closed by a layer of sutures a drainage tube is inserted and the vaginal mucous membranes sutured with the drainage tube in position.

The *modified Spinelli's* operation through the abdominal route is sometimes of great advantage especially in those cases where the cervix is not within easy reach of the finger and considerable difficulty is experienced in reaching the anterior fornix and separating the bladder. We have performed this operation on two occasions and on p. 597 are given the diagrams which give the detailed technique of the operation.

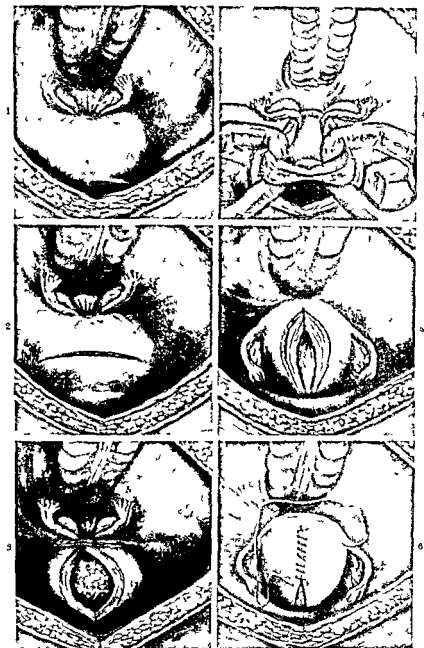


FIG. 162.—Inversion of the uterus showing the steps of the operation in the reduction of the inversion through the abdominal route

CHAPTER XLII

INJURIES TO THE PARTURIENT CANAL

DURING the process of delivery the genital passages are stretched, and in the majority of cases of normal labour such stretching should not lead to any injury. But on account of various factors associated with the phenomena of labour injuries are not uncommon, both in spontaneous as well as in assisted deliveries. The extent of such injuries depends upon the care exercised by the obstetrician and the skill with which the delivery is conducted. Where a proper consideration has been given to all the factors concerned in any particular case it ought to be possible to avoid or at least minimise such injuries. Occasionally however on account of anomalies of the passages the forces of labour, or of the passenger, injuries do occur. In some cases of assisted labour it may be impossible to avoid them but they are usually of a minor nature if the operation has been performed skilfully and the conditions necessary for its safe performance have been observed.

Injuries to the parturient canal may broadly be classified under two heads —

- (1) Injuries to the bony parts
- (2) Injuries to the soft parts

Injuries to the Bony Parts

Injury to the bony parts is extremely rare, but the following may be damaged —

- (a) The symphysis pubis
- (b) The sacro coccygeal joint
- (c) Occasionally the sacro iliac synchondroses

Injury to the Symphysis Pubis This sometimes occurs spontaneously, but is more often produced during the forcible extraction of the head through the pelvic brim either by forceps or in a breech delivery. When it occurs spontaneously, it is generally the result of strong uterine contractions driving the head suddenly through the pelvis. This accident is not generally serious as it does not lead to wide separation of the pubic bones. The patient may complain of pain and tenderness over the symphysis pubis and there is a distinct gap to be felt between the pubic bones.

In cases of artificial delivery, on the other hand the damage is greater as a wide degree of separation of the symphysis pubis usually results and is associated with serious injury to the soft parts. In some cases the urethra and the bladder may be involved, the subjacent vessels may be injured and severe hæmorrhage result. If there is a very wide separation of the bones the sacro iliac joints

themselves may be affected. In the majority of cases however such serious damage does not occur.

Diagnosis The condition is suspected if the patient gives a history of something having given way if the delivery has been spontaneous or during an assisted labour if the operator can feel and sometimes hear the grating sound produced by the snapping of the cartilage. The gap between the pubic bones, the tenderness on pressure and the pain felt more particularly on movement of the limbs confirm the diagnosis.

Treatment consists in keeping the patient at rest on a firm bed with strips of adhesive plaster applied tightly round the whole pelvis so as to immobilise the joint. A firm binder around the pelvis may also be applied and this gives a feeling of security and comfort to the patient. In those cases where difficulty in micturition is experienced care must be taken to see that the bladder is emptied with strict aseptic precautions. The patient may be allowed to move about after two to three weeks and usually little discomfort is felt if treatment has been undertaken sufficiently early.

Fracture and Dislocation of the Coccyx This injury generally occurs during artificial extraction of the foetus. It is more likely to occur in those cases where there is limited mobility at the sacro-coccygeal joint and where the subpubic angle is narrow so that the head has to emerge more posteriorly at the outlet.

The condition may not be recognised till some months after delivery when the patient will probably complain of pain in the lower part of the sacrum particularly in the sitting posture. Palpation of the now unduly mobile or displaced coccyx will enable one to diagnose the condition. Occasionally a persistent neuralgia is present and is known as coccydynia. If the pain is persistent and severe it may be necessary to remove the coccyx.

Injuries to the Sacro-iliac Synchondroses These may result after pubiotomy or when the symphysis gives way spontaneously during the process of delivery. There is flaring out of the iliac bones and the ligaments of the joints are torn and so do not support the pelvic girdle. The patient is unable to use the limbs freely and complains of pain in the region of the sacrum.

Rest in bed with proper support to the pelvis by strapping for two to three weeks may be necessary after which the patient may gradually be allowed to move about.

Injuries to the Soft Parts

Injuries to the soft parts may be —

- (1) Injuries to the vulva
- (2) Injuries to the vagina
- (3) Lacerations of the cervix
- (4) Rupture of the uterus

Injuries to the Vulva The e are very common and if a careful examination be made slight tears of the labia minora the fourchette and sometimes the vestibule may be detected. The lacerations are generally slight and may not require any treatment. Sometimes however it is desirable to suture the tears with catgut.

Lacerations of the vestibule may in some cases give rise to severe hemorrhage resulting from injury to the vessels of the clitoris. The most efficient method of controlling such hemorrhage is by a suture.

The perineum is the most common seat of a tear. The extent of the tear often depends upon the care taken and skill displayed during delivery of the head. The precautions to be taken to avoid such a tear have already been mentioned in dealing with the conduct of normal labour and the care of the perineum. It is important to recognise that every effort should be made to prevent a tear in view both of the immediate and remote effects. A tear of the perineum especially if it is fairly extensive may result in infection of the genital tract owing to the proximity of the anus and if such a tear be neglected the weakness of the pelvic floor will gradually lead to a series of changes resulting eventually in various degrees of prolapse of the uterus and vaginal walls. In some cases although the superficial skin may be intact the deeper structures forming the pelvic floor are lacerated giving rise to weakness of the pelvic floor in the same manner as if a tear of the perineum involving the skin had occurred. In view of these facts it should be a general rule to examine the perineum carefully at every case of labour to see if there are any lacerations and if present carefully to suture the parts so as to re form the perineal body as efficiently as possible.

Four degrees of perineal laceration are described —

- (1) A slight tear of the perineum the tear involving only the fourchette and anterior margin of the perineum
- (2) Lacerations reaching up to the margin of the anus but not involving the sphincter
- (3) Complete laceration of the perineum the tear extending into the rectum
- (4) A central perineal tear which leaves the posterior commissure and the anterior margin of the perineum intact but may involve the central portion of the perineum even up to or including the rectum

Ætiology The most common causes of perineal lacerations are —

- (1) Disproportion between the fœtus and the soft parts. Generally it is due to a large head or an imperfectly flexed head but in some cases particularly with anencephalic monsters and unduly large children the head may not give the same amount of trouble

as the shoulders in the extraction of which the perineum may be badly lacerated

(2) In some cases the vulvar outlet itself may be very small or the parts may be extremely rigid as in an elderly primipara

(3) Too rapid a delivery either spontaneous or assisted may tear the perineum by not allowing the vulva to stretch sufficiently before the head emerges. This is likely to occur in cases of rapid extraction of the after coming head and in forceps application where the head slips out suddenly particularly in occipito posterior positions

(4) Diseases of the soft parts. Old perineal cicatrices œdema of the soft parts generally as a result of prolonged labour or diseases such as infective granulomata and elephantoid conditions of the perineum predispose to lacerations

(5) A narrow subpubic angle by causing the head to emerge on a more posterior plane may cause undue stretching of the perineum and thus favour lacerations. In a contraction of the bony pelvic outlet the perineal laceration tends to be of the third degree

Diagnosis Perineal lacerations can easily be diagnosed by a careful local examination after delivery. It is necessary to examine the vulva in a good light and to separate the labia to see to what extent the pelvic floor has been damaged with or without involvement of the skin

Treatment—Prophylactic If proper care is taken in the protection of the perineum as already outlined in the chapter on the conduct of normal labour a large number of perineal lacerations can be avoided. Even when they seem inevitable the lacerations may be limited to the first degree or occasionally the second degree but should never involve the rectum. When operative delivery is undertaken it is exceedingly important to realise that sudden extraction will lead to serious perineal lacerations. It has been our practice not to complete the delivery of the head with the forceps but to allow it to stretch the perineum so that the woman with each breath as it were breathes out the head. This allows sufficient time for the perineum to stretch so that when the head is almost crowned the forceps is removed and the delivery completed in the manner already described under normal labour. When the aftercoming head is to be delivered once it has passed through the brim of the pelvis there is no necessity for undue haste and the head should be delivered gradually allowing the perineum to stretch

Another precaution that ought to be taken in breech cases is to iron out the vagina and so stretch the perineum sufficiently before the breech is delivered. Much of this ironing out is done if the breech is allowed gradually to distend the perineum before it is extracted

In cases however where a tear of the perineum is inevitable an incision may be made with a view to ensure a clean cut and by

diverting it away from the anus so prevent extension of the tear to the rectum. Such an operation is known as episiotomy. Episiotomy may be either central or mediolateral. Before such an operation is undertaken care must be taken to see that the head has stretched the perineum to its maximum extent.

Episiotomy is generally done by a mediolateral incision with a pair of scissors. The perineum is cut through to one or other side of the median line and generally at an angle of 30° from it. The advantage in performing the mediolateral episiotomy is that if the incision should unfortunately extend it will lead farther away from the anus so that the sphincter is never involved. Perineal tears and episiotomy wounds seldom bleed profusely. After delivery of the foetus the episiotomy incision is carefully sutured up. In cases where the outlet is very narrow and the perineum likely to tear extensively a double episiotomy may sometimes be done. This is not however desirable as weakening of the pelvic floor is likely to result. In a few cases where the extent of the tear can be easily gauged a central incision in the median raphæ is sometimes done and so the levator ani fibres are not damaged. Care must be taken however to see that there is no possibility of its extending towards the rectum during the further course of delivery.

Curation. All tears of the perineum must be carefully sutured. In lacerations of the first degree a couple of catgut sutures to the vaginal mucous membranes may first be applied so as to bring the edges into apposition and then the skin with the whole thickness of the perineal body may be sutured up with silk or linen thread. If there is a clean tear of a minor degree it is unnecessary to put in the vaginal catgut sutures. The whole thickness of the perineal body can be closely approximated by through and through perineal sutures.

During the operation the following facts have to be borne in mind. The levatores ani should be closely approximated, the vaginal tears should be sutured, if the rectum is involved it should be reformed carefully by suturing the anterior rectal wall, and lastly, the skin edges should be brought into apposition. Catgut sutures are generally used for the deeper structures and silk or linen thread for the skin.

For proper union the after care of the case is all important. The legs should be kept in close apposition and the parts kept clean and dry. It is better in these cases not to allow the bowels to move

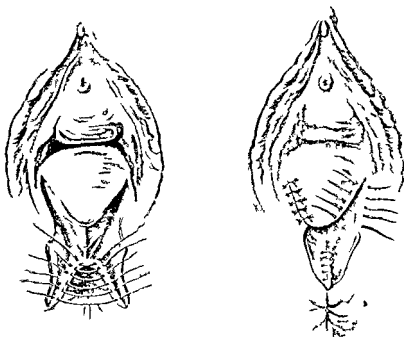


FIG. 163. Repair of a complete laceration of the perineum.

for the first three days. Later when the bowels are allowed to move particular care should be taken to see that after each evacuation the perineum is thoroughly cleaned, dried, and a mild antiseptic applied. The patient is given light diet. On the fifth or sixth day, in cases of complete tear the patient may be given a light laxative. In some cases where hard, scybulous masses are formed it is desirable to inject an ounce or two of olive oil into the rectum so as to soften the feces and follow this if necessary, by a glycerine enema. Usually the perineal sutures are removed by the eighth day. If these sutures are cutting through it is better to remove them even earlier. Occasionally a certain amount of œdema of the perineum develops when it may be desirable to apply hot boric fomentations. If however the perineum has

diverting it away from the anus so prevent extension of the tear to the rectum. Such an operation is known as episiotomy. Episiotomy may be either central or mediolateral. Before such an operation is undertaken care must be taken to see that the head has stretched the perineum to its maximum extent.

Episiotomy is generally done by a mediolateral incision with a pair of scissors. The perineum is cut through to one or other side of the median line and generally at an angle of 30° from it. The advantage in performing the mediolateral episiotomy is that if the incision should unfortunately extend it will lead farther away from the anus so that the sphincter is never involved. Perineal tears and episiotomy wounds seldom bleed profusely. After delivery of the fœtus the episiotomy incision is carefully sutured up. In cases where the outlet is very narrow and the perineum likely to tear extensively a double episiotomy may sometimes be done. This is not however desirable as weakening of the pelvic floor is likely to result. In a few cases where the extent of the tear can be easily gauged a central incision in the median raphe is sometimes done and so the levator ani fibres are not damaged. Care must be taken however to see that there is no possibility of its extending towards the rectum during the further course of delivery.

Cura—All tears of the perineum must be carefully sutured. In lacerations of the first degree a couple of catgut sutures to the vaginal mucous membranes may first be applied so as to bring the edges into apposition and then the skin with the whole thickness of the perineal body may be sutured up with silk or linen thread. If there is a clean tear of a minor degree it is unnecessary to put in the vaginal catgut sutures. The whole thickness of the perineal body can be closely approximated by through and through perineal sutures.

Lacerations of the second and third degree require much more thorough repair. The perineal repair may be done before expulsion of the placenta but it is not advisable to do this where there are extensive tears of the perineum as in the subsequent delivery of the placenta should difficulty arise and manual removal of the placenta be necessitated the perineal stitches will have to be removed. It is better therefore to wait till the end of the third stage of labour before repair is undertaken.

In all cases the patient should be anaesthetised with general or local anaesthesia before repair of the perineum. She is brought to the edge of the bed and placed in the lithotomy position. The area is cleaned and exposed to a good light. In complete lacerations involving the rectum the repair should be done with proper assistance and with all aseptic precautions. After thoroughly cleansing the wound and the adjoining surfaces the area may be kept fairly dry by inserting a large sterile sponge into the vagina to prevent the flow of blood.

During the operation the following facts have to be borne in mind. The levatores ani should be closely approximated, the vaginal tears should be sutured, if the rectum is involved it should be reformed carefully by suturing the anterior rectal wall, and lastly, the skin edges should be brought into apposition. Catgut sutures are generally used for the deeper structures and silk or linen thread for the skin.

For proper union the after care of the case is all important. The legs should be kept in close apposition and the parts kept clean and dry. It is better in these cases not to allow the bowels to move

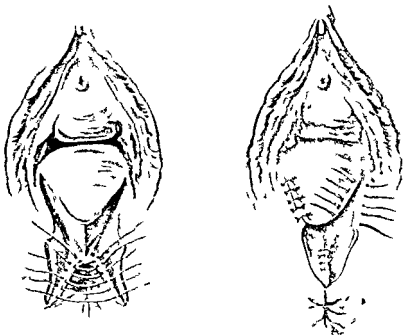


FIG. 163.—Repair of a complete laceration of the perineum.

for the first three days. Later, when the bowels are allowed to move, particular care should be taken to see that after each evacuation the perineum is thoroughly cleaned, dried, and a mild antiseptic applied. The patient is given light diet. On the fifth or sixth day, in cases of complete tear, the patient may be given a light laxative. In some cases where hard, scybilous masses are formed it is desirable to inject an ounce or two of olive oil into the rectum, so as to soften the faeces, and follow this, if necessary, by a glycerine enema. Usually the perineal sutures are removed by the eighth day. If these sutures are cutting through it is better to remove them even earlier. Occasionally, a certain amount of oedema of the perineum develops, when it may be desirable to apply hot boric fomentations. If, however, the perineum has

not united and there is evidence of infection one must face the inevitable necessity of removing the sutures so as to permit of drainage. Healing occurs later by second intention.

Secondary Repair of the Perineum This question sometimes arises in cases where the primary perineal repair is unsuccessful. In such cases it is desirable not to operate too soon. We recommend the patient to seek admission three to four months after delivery as by that time the tissues will be sufficiently clean and healthy and not too friable to allow of another operation.

Central Perineal Rupture This is a somewhat rare accident in precipitate labour. The head is driven down and instead of the perineum tearing from the posterior commissure the tissues give way in the central portion midway between the rectum and the commissure. The head may then descend through this rent. Occasionally, when this occurs in an exaggerated form, the head has been seen to be delivered through the rectum.

In repairing this form of laceration where the rectum is involved, it is well to divide the narrow bridge between the laceration and the commissure thus making it a complete tear before suturing.

If however, the rectum has escaped it may in some cases be sufficient to suture the central tear in the perineum.

Where perineal lacerations are associated with considerable oedema and bruising of the soft parts it may not be desirable to suture the rent immediately for fear of infection and sloughing of the parts. In such cases the sutured perineum is not likely to heal and indeed the chances of infection are increased by trying to suture up such a perineum. Healing occurs by second intention and it is best under such circumstances to advise the woman to undergo a perineal repair at a later stage.

Lacerations of the Vagina Lacerations of the vagina are not uncommon and more generally occur in forceps deliveries and breech extractions. Particularly in cases of forceps application in occipito posterior positions are such lacerations likely to occur. They are more frequent where the head has to be rotated artificially and are severe if the forceps slips on applying traction after improper application. Sometimes vaginal tears are due to the symphysis pubis giving way or to the separation of the pubic bones in a pubiotomy. Such tears may involve the urethra and the bladder. Vaginal tears may also result from defects in the instrument. The forceps blades may be not sufficiently smooth and rounded and thus act as cutting blades or defects in the manner of fixing the axis traction rods may occasionally be responsible for such tears.

A more severe form of trauma may result after delivery in cases where the head has been jammed in the pelvis for a long time. In such cases the necrosis resulting from the prolonged pressure of the head and possible superadded infection may produce sloughs.

of the vagina which when they separate may lead to fistulous tracts communicating either with the bladder or with the rectum. Vaginal tears may be either longitudinal or transverse and when involving the fornices may extend to the pelvic cellular space. The chief danger of vaginal tears is infection which in some cases may result in a severe septicæmia. Slight lacerations of the vagina do not require any particular treatment but if there is an extensive tear it is necessary to suture it. There is usually an associated perineal tear and the repair of the vagina is combined with the perineal reconstruction.

Lacerations of the Cervix The cervix after parturition is never the same as before. Minor lacerations occur in practically all cases. But deep tears are due to causes which are largely preventable.

The chief causes of cervical lacerations are —

(1) Rapid delivery of the fœtus by the natural powers or in assisted labour when the cervix is not completely dilated. Thus in precipitate labour the cervix may be torn. More often however it is the accoucheur who is at fault and either by applying forceps when the cervix is not fully dilated or more frequently by extracting a breech presentation is the cervix liable to serious injury.

(2) Rigidity of the cervix. This may in some cases be due to natural causes. More often it is due to diseased conditions. In old primipare the cervix tends to be more rigid. In some cases where the cervix has been lacerated previously or has been the seat of extensive operative procedure the resulting scarring may give rise to a rigidity which inevitably leads to a tear. If every case of labour is attended to with care and delivery attempted only after complete dilatation of the cervix that is after its effacement and retraction above the presenting part serious lacerations will be far less common. In some cases however delivery may have to be effected before complete dilatation of the cervix. This may be due either to rigidity of the cervix which does not allow of the natural effacement of the cervical canal or to the necessity for hurrying the delivery in the interests of either the mother or the child. The methods of dilating the cervix under such circumstances have been referred to elsewhere. One such method is to incise the cervix according to Dührssen's method for these incisions can be more easily controlled than spontaneous lacerations and properly sutured after delivery.

Occasionally the rent in the cervix may extend upwards and involve the lower uterine segment opening up the pelvic cellular space and even the peritoneal cavity. These extensive tears will be more fully described under rupture of the uterus.

A complication that may sometimes occur is a circular tear or avulsion of the cervix. This may be due to a faulty application

of the forceps where the cervix is caught between the blades and the head so that when traction is applied a whole ring of the cervical tissue comes off. In some cases it may occur spontaneously when the uterus suddenly forces the head down.

Cervical tears are generally discovered after delivery as they cause hæmorrhage which though not necessarily profuse is continuous. Tears of the cervix are much more liable to occur in cases of placenta prævia where owing to the low implantation of the placenta the tissues are sodden and soft.

Prognosis. Small tears of the cervix usually heal without trouble but the risk of infection should always be borne in mind.

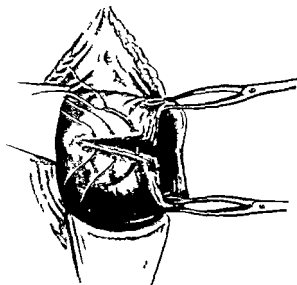


FIG. 164.—Suturing of cervical tear after delivery.

Larger tears however may immediately give rise to severe hæmorrhage and later produce extensive scarring which extends to and involves the vaginal vault. They lead to ectropion and persistent cervicitis which may predispose to malignancy. In some cases sterility, repeated abortions, premature labour or dystocia may occur as late sequelæ of old lacerations. When the tear extends into the parametrium, pelvic cellulitis and infection of the uterus and other complications may result.

Treatment. In minor tears not giving rise to any severe hæmorrhage it is not desirable to meddle with the cervix immediately after delivery. While there is no doubt that such small lacerations may give rise to a certain amount of chronic cervicitis, the danger of puerperal infection is so great by meddling some interference soon after delivery that it is much better if

these cases are treated some weeks or months later, rather than having every case examined at delivery as a matter of routine for the possibility of cervical laceration. Our practice has been only to interfere in those cases where a definite fairly severe laceration of the cervix is known to have occurred or a postpartum hæmorrhage is obviously traumatic in type as the uterine body is well contracted.

In such cases the parts should be examined under strict aseptic precautions by inserting a posterior vaginal speculum and the cervix held by a couple of sponge forceps. We do not advocate the use of volsella under such circumstances as they lead to tears and cut through the soft cervix.

The two torn edges are brought into close apposition by means of interrupted catgut sutures avoiding the endocervix.

Occasionally the tear of the cervix may lead to severe bleeding which makes it impossible easily to see the laceration. Under such circumstances feel for the laceration and pass a suture just above the apex of the tear on each side and tie these when the greater part of the bleeding will be arrested and the further steps in the repair can be more easily undertaken.

The after care of such cases is also important. If there is evidence of infection the vagina may have to be douched daily. It is desirable after a couple of weeks to examine the patient to see if healing has occurred and if the cervical lacerations have not healed properly the patient should be advised to seek further treatment after three months.

RUPTURE OF THE UTERUS

This is one of the most serious of accidents that may occur in pregnancy or labour. In the majority of cases the accident is due to neglect during labour. In a few instances however it has occurred without such a cause.

Rupture of the uterus may take place at three distinct periods —

- (a) During pregnancy
- (b) Early in labour
- (c) In cases of prolonged labour

Rupture of the Uterus during Pregnancy During pregnancy spontaneous rupture of the uterus may sometimes occur in the last trimester. When rupture occurs in the earlier periods of pregnancy it is generally due to pregnancy in a bicornuate or an infantile uterus. Rarely it may be due to the invasion of the uterine wall by foetal elements such as in hydatidiform mole.

In the later months of pregnancy rupture may be caused by several factors —

- (1) Diseased condition of the uterine musculature
- (2) Weak uterine scars as a result of previous operations on the uterus
- (3) Traumatic causes from a fall or other injury

Cases are reported where after a previous Caesarean section, the scar has given way in the later weeks of pregnancy. Occasionally a uterus which has been previously damaged by perforation either with a curette or a sound may in a subsequent pregnancy rupture owing to the weakness of the cicatrix formed. Where operations, such as myomectomy have been performed on the uterus the resulting scar may give way during pregnancy or labour. In some cases either due to previous diseased conditions of the uterus or septic conditions associated with previous labours the musculature has been thinned out and deficient and yields to the increasing tension.

Traumatic causes are generally due to injuries, falls or blows, and are more frequent in multiparae than primiparae. Cases are not infrequent where rupture has taken place as a result of going by a bull or other animal.

Rupture when pregnancy occurs in an infantile uterus is most rare as in women with infantile uterus sterility is the rule. When pregnancy does occur in a uterine horn rupture may take place and then the phenomena are akin to those of a ruptured ectopic

Rupture of the Uterus after Prolonged Labour During labour rupture of the uterus may occur spontaneously or as a result of operative interference. In the majority of cases where rupture occurs as a result of operative interference the conditions are already present which favour easy rupture. This will be evident after consideration of the condition of the uterus in cases of prolonged labour, where the need for operative interference is greatest.

Ætiology The factors concerned in rupture of the uterus are —

- (1) Predisposing causes, and
- (2) Exciting causes

Predisposing Causes Conditions which produce a weak uterine musculature, fatty or hyaline degeneration, syphilis, pressure necrosis due to prolonged labour, scars from previous operations on the uterus, septic conditions in previous labours and inflammatory conditions of the muscle, overdistension of the uterus, congenital anomalies, etc.

The mechanical factors concerned are those which produce a relative disproportion between the foetus and the pelvis. These may be due to contraction of the bony pelvis, malpresentations such as shoulder, face, brow compound, excessive development of the foetus, deformities of the child such as hydrocephalus, hydrothorax, monstrosities, tumours obstructing the course of delivery, anomalies of the soft parts such as rigid cervix or perineum, growths of the vulva, sacculations of the uterus, pendulous abdomen, etc. In fact, all factors that tend to prevent the descent of the foetus and obstruct it at any stage in its progress through the birth canal are likely to lead to rupture of the uterus.

The exciting causes connected with rupture of the uterus are contractions of the uterus and the mechanical obstruction caused to the descent of the foetus as well as direct trauma from operative interference. This includes rupture of the uterus resulting from the extension of cervical tears due to attempts at artificial delivery before the cervix is fully dilated. The improper use of ecboics such as pituitary extract during the course of labour has not infrequently resulted in rupture.

Mechanism of Rupture This will be evident from a consideration of the changes in the uterus in cases of prolonged labour. During labour the uterus becomes well differentiated into two portions, physiologically separated by a circular ring of tissue to which the term 'retraction or Bandl's ring' is usually applied. The upper two thirds of the uterus contracts and thus helps to expel the foetus while the lower third undergoes dilatation and elongation and progressively forms a canal through which the foetus is finally expelled. As the upper uterine segment progressively contracts

and retracts its wall becomes thicker and thicker. The lower uterine segment on the other hand dilates and its wall becomes progressively thinner so that at the junction of the upper and lower uterine segments a distinct demarcation ring—Bandl's ring—can be made out. This ring must necessarily form in all cases of labour but in cases of prolonged labour as the capacity of the upper uterine segment is gradually diminished by retraction of its muscle wall the greater part of the foetus has got to be accommodated in the lower uterine segment with the result that this

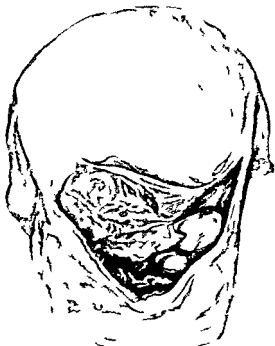


FIG. 163. Puptured uterus. The tear is in the posterior wall of the lower uterine segment.

segment is dilated much more than usual and its walls get progressively thinner and thinner. This increased dilatation of the lower uterine segment naturally results in its upper margin progressively rising higher and higher. It is in consequence of this phenomenon that Bandl's ring can be appreciated at a higher level in cases of prolonged labour. Therefore the height of the Bandl's ring serves as an indication of the amount of stretching that the lower uterine segment has undergone and consequently of the thinness of its musculature. The higher the Bandl's ring above the symphysis the greater is the dilatation of the lower uterine segment and the thinning of its wall. In the ordinary course of events if obstruction is not gross the foetus passes through

the pelvic canal either spontaneously or with some assistance from the accoucheur and is born before a dangerous degree of dilatation of the lower uterine segment can take place. If however the patient is not watched carefully or no proper medical assistance is available and the obstruction is insuperable for the uterine contractions to overcome a stage will be reached when the lower uterine segment cannot dilate any further and with the continued and increased efforts of the uterus forcing the foetus more and more into the lower uterine segment the musculature gives way at its weakest part. It is for this reason that rupture in cases of prolonged labour is always confined to the lower uterine segment.

The tear may be transverse or oblique may involve the whole wall or only a portion of it leaving the peritoneum intact.

When rupture takes place there is necessarily a certain amount of intra abdominal bleeding. As a result of the rupture the foetus may escape partially or wholly into the abdominal cavity. This will depend naturally upon the degree of the tear and in some cases where an extensive tear has occurred the whole of the foetus and the placenta may be found floating in the abdominal cavity. In other cases a limb of the foetus may escape in others again although a tear is present no part of the foetus escapes outside the uterus. Occasionally the tear may extend into the pelvic cellular tissue and may open up the broad ligament on either side.

When hæmorrhage takes place the blood may be retained in the abdominal cavity or some of it may escape through the vagina. But the external bleeding is never profuse and it may not occur if the presenting part is jammed in the pelvic cavity. When rupture occurs usually the presenting part recedes.

Varieties Rupture of the uterus may be complete or incomplete. It is said to be complete when all three coats including the peritoneum are involved whereas in cases of incomplete rupture the peritoneum is generally intact and only a portion of the musculature gives way.



FIG. 166.—Rupture lower segment due to congenital hypertrophic elongation of cervix.

Signs and Symptoms These vary considerably. In cases of rupture occurring during pregnancy or early in labour the patient may experience a sharp sudden abdominal pain and symptoms of shock and collapse immediately supervene. In other cases the patient may complain of some pain and general malaise; grave symptoms may not develop till much later when infection has occurred.

In cases of rupture following prolonged labour the signs and symptoms of prolonged labour precede the rupture. The patient has been a long time in labour, the membranes have ruptured, the retraction ring is easily palpable and the round ligaments stand out prominently. There is severe pain and tenderness over the region of the lower abdomen and the contractions of the uterus very frequent or even continuous. The patient has got an anxious look and is restless and the associated signs of prolonged labour are manifest, the vagina being dry and hot, the presenting part fairly high up with a large caput and signs of foetal distress are present. At the height of a contraction rupture occurs when the characteristic picture is complete. There is a sharp acute pain with a sudden cry from the patient followed by immediate signs of shock and collapse due to internal hæmorrhage. After rupture the patient may feel a certain amount of relief as the uterine contractions cease. External hæmorrhage may sometimes occur but is not constant. Shock and collapse become more prominent, the pulse is small and rapid, the patient usually vomits. The presenting part often recedes from the pelvis and it will be noticed that on abdominal palpation the foetal parts, particularly the limbs, are very easily palpable and the contour of the uterus is changed. If the foetus has escaped into the abdominal cavity it will be easily felt through the thin abdominal wall and the contracted upper uterine segment may be felt as a hard mass lying alongside the foetus. If the patient is not immediately attended to the terminations are either rapid death from collapse due to hæmorrhage and shock or delayed death from peritonitis with septicæmia.

Diagnosis This is not difficult in most cases. It is important to recognise the condition of threatened rupture apart from the actual rupture.

Threatened Rupture In such cases the following important signs and symptoms will be noted —

- (1) The patient is restless and anxious with a slightly elevated temperature.
- (2) The contractions of the uterus are strong and recur very frequently. They may be continuous that is tetanic contraction.
- (3) The contour of the uterus is characteristic. A thick hard mass above with a fairly thin stretched-out lower portion while

between the two Bands ring can be easily made out. This will be noted at a much higher level than usual running obliquely across the abdomen and it may even be as high as the umbilicus. The round ligaments are hard and stand out prominently as tense cords. The foetal parts cannot be recognised on palpation through the tonically contracted uterine wall. There is no foetal heart audible as circulation through the placental site has been stopped by the continuous contraction of the muscular fibres and so killed the foetus. The bladder may be distended. Vaginal examination reveals the large caput the dry and hot vagina with the presenting part more or less jammed in some portion of the pelvis or still high up above the brim. These signs and symptoms should at once suggest the possibility of threatened rupture and should put the obstetrician on guard.

Actual Rupture The history given is significant. The patient will complain that at the height of a severe pain she suddenly felt something give way inside followed almost immediately by a feeling of relief. On examination the patient is found in a condition of shock and collapse pulse rapid and thready temperature may be subnormal uterine contractions now absent signs of intra abdominal haemorrhage may be elicited with dullness in the flanks may be determined the foetus is now easily palpable underneath the abdominal wall general tenderness over the whole abdominal region is present the vaginal findings are similar to those in threatened rupture except for the fact that the presenting part may have receded. It may be possible to feel the rent when it has extended low down or manual intra uterine exploration is made under anaesthesia and in some cases portions of the intestine prolapsed through the rent may be palpable.

Differential Diagnosis In typical cases little or no difficulty is experienced in the diagnosis of this condition. Occasionally in cases of prolonged labour it may be difficult to realise whether the uterus is threatening to rupture or has actually ruptured. Not infrequently the fact of rupture having occurred can be elicited only after delivery has been completed when either by a thorough internal examination or by failure to express the placenta and the patient's deteriorating general condition the suspicion is aroused that rupture may have taken place. This difficulty is likely to be experienced more in those cases where the foetus has not escaped into the abdominal cavity or the rent is proportionately small.

It is more difficult to differentiate between complete and incomplete ruptures of the uterus. Not infrequently incomplete rupture of the uterus is not diagnosed until later in the puerperium when signs of peritonitis suggest this possibility.

Other conditions with which rupture of the uterus may occasionally be confused are concealed accidental hæmorrhage and secondary abdominal pregnancy

Traumatic Rupture This is the result of some trauma Rupture as a result of falls injuries etc has already been referred to More frequently perhaps traumatic rupture occurs in the course of delivery when the obstetrician with an imperfect realisation of the extent of the stretching of the lower uterine segment attempts to extract the foetus Consequently it is more frequent in cases of internal podalic version done late in labour It may also occur in forcible attempts at extraction of the head or shoulders especially when the cervix is not fully dilated

Occasionally during the introduction of the blades of the forceps if care is not taken the blade may lacerate a portion of the stretched out lower uterine segment The symptoms are similar to those of spontaneous rupture

Prognosis—Fatal This is bad as the foetus generally dies at the time of rupture or soon after

Maternal The prognosis for the mother is very grave There are the serious risks of shock and hæmorrhage and of septic peritonitis and general septicæmia so that in cases of rupture the mother has to negotiate several dangers before she can be said to be safe

The prognosis in cases of traumatic rupture is perhaps more favourable than in rupture after prolonged labour provided the diagnosis is made immediately and proper treatment adopted.

Treatment—Prophylactic The prophylactic treatment of this condition is by far the more important as with proper care such a catastrophe should not occur Efficient antenatal care which includes the diagnosing and correction of malpresentations the recognition and determination of the degree of any disproportion and recognising any defects of the uterus due to previous disease or operation will go a long way to ward off the possible occurrence of rupture If every case is carefully studied the extent of the disproportion correctly estimated and labour watched carefully it ought to be possible sufficiently early to determine whether labour can terminate spontaneously without risk or some assistance is required In prolonged labour it is imperative that the case should be thoroughly investigated All malpresentations should be corrected particularly if transverse brow or compound Where the woman is seen late in labour with signs suggestive of threatening rupture the most conservative method of delivery should be adopted immediately In the majority of cases the foetal heart is inaudible so that the treatment is entirely directed to saving the mother Thus in cases of transverse presentation decapitation or spondylotomy is indicated in cases of brow mento posterior

or neglected occipito posterior positions craniotomy may be the operation of choice, in cases of compound presentation if the fetal heart is not audible craniotomy had better be performed. Cases of hydrocephalus should be delivered after perforation of the head.

Curative Treatment It has been suggested that if the child is alive laparotomy should be immediately performed and after removal of the fœtus, the uterine tear attended to in the best manner possible either by suture of the rent or by supravaginal or total hysterectomy. It must be confessed that the possibility of obtaining a live child is greater in traumatic rupture and in rupture occurring during pregnancy. We have never met with a case where the fœtus was alive when rupture of uterus followed prolonged labour. The next question to decide is if the fœtus is dead and rupture has taken place after prolonged labour what mode of treatment should be adopted? There are two conditions which have to be taken note of (1) the fœtus may be completely within the uterus or it may have escaped partially or wholly into the abdominal cavity (2) The condition of the patient. The ideal method of treatment in such cases particularly if the fœtus has escaped into the peritoneal cavity is to open the abdomen remove the fœtus and perform a total hysterectomy. It is impossible to suture a uterus that has ruptured after prolonged labour owing to the irregularity of the tear and the extensive damage to the musculature. On the other hand cases do occur where the patient cannot stand an immediate laparotomy with total hysterectomy.

The factors to be taken into account in determining the line of treatment to be adopted are —

- (1) The condition of the patient when seen
- (2) The condition of the fœtus
- (3) Whether the rupture has occurred during pregnancy, early in labour or late in labour
- (4) Whether it is spontaneous or the result of operative interference
- (5) Whether in consequence of the rupture the fœtus has escaped into the peritoneal cavity
- (6) Whether the rupture is complete or incomplete
- (7) The particular causative factor of the rupture
- (8) The surroundings of the patient and the facilities available for treatment—whether hospital treatment is possible
- (9) The experience of the obstetrician concerned

It will be seen from the above that a large variety of factors may be associated with a particular case and the final decision as to the mode of treatment should be based upon a correct appreciation of these factors.

Among the methods of treatment that are possible may be mentioned :—

- (1) Laparotomy with complete removal of the uterus—total hysterectomy.
- (2) Laparotomy with supravaginal hysterectomy.
- (3) Laparotomy with repair of the tear.
- (4) Delivery through the vaginal route followed by laparotomy and hysterectomy or repair.
- (5) Delivery through the vaginal route with plugging of the rent in the uterus and vagina.
- (6) Marsupialisation of the ruptured uterus.

Treatment of Spontaneous Rupture of the Uterus during Pregnancy.

If the rupture is diagnosed early, the condition of the patient may be favourable for an immediate laparotomy. The child should be delivered by enlarging the tear in the uterus sufficiently by an incision. The question arises whether the uterus may be saved by suturing up the rent. In the majority of cases, as a rent will be in the area of a previous scar, and as the musculature will be fairly healthy, such a repair of the rent can be made after excision of the scar tissue, so as to bring muscular edges together. Bruising of the musculature is not likely, and the chances are that primary union will take place. If, however, the laceration is irregular and involves much of the uterine musculature, it may be necessary to perform a hysterectomy either supravaginal or total, particularly in multiparous women.

Treatment of Rupture of the Uterus early in Labour. In these cases also the tear is similar to the one that occurs in the later weeks of pregnancy. An immediate laparotomy and, if necessary, extraction of the fœtus through a uterine incision should be performed. The method of dealing with the rent is similar to what has been advised in cases of rupture in the later weeks of pregnancy.

Treatment of Traumatic Rupture of the Uterus. In the majority of cases this is a result of operative procedures, and should be diagnosed as soon as it occurs. We have referred to the importance of prophylactic measures, but if a rupture does take place, the most satisfactory method of treatment is to perform an immediate laparotomy. After the delivery of the fœtus, the question of dealing with the uterine rent has to be considered. If there is a clean tear, it may be possible to suture it up. If, however, in a case of prolonged labour, consequent upon internal podalic version or application of forceps, a large rent has occurred, and considerable bruising of the tissues is already evident, one must consider the desirability of performing a hysterectomy. Total hysterectomy is preferable in all such cases as it removes the heavily infected cervix, unless the condition of the patient is such as to make it necessary

where the child is wholly in the abdominal cavity, or where so much of the foetus has escaped through the rent as to make it inadvisable to attempt to deliver it from below, we prefer first to deliver the foetus through the vaginal route and then decide as to the best method of dealing with the rupture

Selection of the best method of dealing with the rent depends upon the following factors —

- (a) The condition of the patient
- (b) Her surroundings
- (c) The facilities available

There are two methods of treatment that may be adopted in such cases (a) radical and (b) conservative. In institutions generally and wherever it is possible, the radical method may be adopted. This consists in a laparotomy being performed, followed by a hysterectomy, preferably total. We have already referred to the method of dealing with the foetus if it has escaped completely into the abdominal cavity, or to such an extent that it is undesirable to attempt to deliver it through the vagina. The first thing to be done at laparotomy is to remove the foetus, if necessary by enlarging the rent in the uterus to allow of the foetus being easily removed. Thereafter a total hysterectomy is the best procedure. The chances of infection are so great, the cervix itself being bruised and infected that it is not desirable to leave the cervical stump. In rare cases it may perhaps be safer to perform only a supravaginal hysterectomy, in view of the condition of the patient.

Occasionally it may be possible to suture up the uterine rent particularly if it is small and the edges are not very ragged. In such cases the desirability of leaving a drain in the peritoneal cavity should always be borne in mind.

Conservative Treatment This method may be resorted to when facilities are not available for laparotomy and subsequent hysterectomy, as in cases where treatment has to be carried out at home or where the condition of the patient is so unsatisfactory that she cannot stand the radical line of treatment. In the tropics where cases of rupture of the uterus from prolonged labour are by no means uncommon and where patients are generally brought from villages several miles away it is often disastrous to attempt the radical line of treatment in view of the critical condition of the patient. In such cases we adopt the conservative line of treatment as being the only line possible and not infrequently with satisfactory results.

Where conservative treatment is adopted the foetus is delivered through the vaginal route by one of the methods already described and in the most conservative manner—perforation decapitation

and extraction being generally adopted. The placenta is then removed manually. Sometimes gentle traction on the cord may help to extract the placenta which has separated and is lying loose near the rent. After the placenta has been removed an injection of pituitary extract and ergotin is given and plugging of the rent in the uterus and vagina carried out. The plugging may be done tightly or occasionally loosely. In the majority of cases we prefer a tight plug in the lower uterine segment and vagina. The object of the plug is twofold. By compression it prevents the possibility of any fresh hæmorrhage occurring from the rent and by occluding the tear it prevents prolapse of any of the contents of the abdomen. Not infrequently portions of omentum or loops of intestines tend to get prolapsed. A long strip of gauze soaked in saline is generally used for plugging and the pack is usually left *in situ* for twenty four hours. During this period the patient is treated for shock and collapse. At the end of the twenty four hours the gauze is gently removed and a fresh plug put in loosely so as to cover the rent. These pieces of gauze are removed at the end of every twenty four hours for the next two or three days.

The conservative method of treatment in suitable cases has yielded better results than the radical method. The patient has however to surmount several dangers. The immediate shock and collapse may sometimes prove fatal but if she recovers from it within twenty four hours she has got a fighting chance.

The other complications that may supervene are —

- (1) Peritonism and general peritonitis
- (2) Sepsis
- (3) Secondary hæmorrhage

The patient is generally placed in Fowler's position and carefully watched during the next forty-eight hours for signs of peritonitis. If she survives this danger the obvious risks of uterine sepsis need not be elaborated. The remote danger of secondary hæmorrhage occurs a week or ten days afterwards. Sometimes it may occur as late as the third or fourth week after delivery. It is generally dealt with by tight vaginal plugging and treatment given for the condition of collapse. We have had a mortality of about 50 per cent by the conservative method.

Marsupialisation of the Uterus This has been tried in some cases where the tear is favourably situated anteriorly. The tear in the uterus is sutured up to the margins of the abdominal wound to allow of free drainage of the uterine cavity to the outside.

Care during Subsequent Pregnancy A question that arises is what should be the subsequent mode of management of such cases in view of the danger of a rupture at a succeeding pregnancy? This will depend upon the nature of the puerperium. Where the

patient has had a stormy convalescence owing to septal salpingitis, pelvic cellulitis etc the chances of pregnancy are remote as the tubes are occluded by adhesions and in such cases one need not worry. In other cases however where the convalescence has been more favourable an attempt should be made to visualise by lipiodol injections and skiotam the condition of the uterus and the tubes. If the tubes are patent and pregnancy should result the patient should be apprised of the possibilities of a rupture and should be advised to seek institutional treatment sufficiently early in the last trimester of pregnancy so as to be kept under continuous observation. It is probably safer to perform a Cæsarean section at term in stead of allowing the woman to go through labour by the natural passages.

CHAPTER XLIII

ASPHYXIA NEONATORUM

So long as the fetus is *in utero* it is supplied with oxygen from the maternal circulation through the placenta. Immediately after it is born the respiratory centre is stimulated and the child begins to breathe and cries out lustily. The gradual increase of carbon dioxide in the fetal circulation during the second stage of labour is the factor which helps to stimulate the respiratory centre.

In some cases however the child does not breathe immediately after birth and it is then said to be in a condition of asphyxia.

There are two varieties of asphyxia —

- (1) Asphyxia livida or blue asphyxia.
- (2) Asphyxia pallida or white asphyxia.

The causes of asphyxia are many and among the chief factors responsible may be mentioned —

(1) Interference with the supply of blood to the fetus by pressure on the umbilical cord or because of faulty placental circulation. Pressure on the umbilical cord may result from prolapse of the cord the cord being nipped between the presenting part and the maternal pelvis true knot of the cord twists of the cord or loops of cord round the neck or limbs of the fetus becoming tightened and occasionally from faulty implantation of the cord as in velamentous insertion. The placenta may be compressed in cases of prolonged labour or in the presence of tonic contractions of the uterus or antepartum hæmorrhage the placental circulation may be diminished or stopped.

(2) Direct injuries to the fetus. This most often occurs in assisted delivery and is due to excessive compression of the head

In forceps deliveries and in extraction of the after coming head pressure may be so great that it involves serious compression of the vital centres or causes intracranial hæmorrhage. In such cases the child is usually born in a state of severe asphyxia pallida.

(3) Premature respiratory efforts by the fœtus. This may occur in cases of breech delivery the child attempting to breathe before delivery of the head thus sucking in mucus and liquor amni.

Asphyxia livida. Here the child is dark blue in colour the skin is cyanosed the muscular tonus is not lost and cutaneous reflexes are present the muscles are fairly firm and the sphincters are active. The cord is full and the heart beats strongly. The child may occasionally make an attempt to breathe. These cases respond readily to treatment and the prognosis is therefore good.

Asphyxia pallida. Here the child is pale. The muscles are flaccid the tonus is lost the jaw is relaxed the sphincters do not act. The cutaneous reflexes are absent. There is no attempt at respiratory movements and the cord is collapsed or pulsates feebly and the heart beats are rather feeble.

The chief points of difference between asphyxia pallida and livida are the absence of muscular tonus and the loss of reflexes in the pallid type. If prompt treatment is not undertaken the heart may fail and respirations never become fully established.

The prognosis in white asphyxia is grave.

The signs of threatening asphyxia while the fœtus is still *in utero* are —

(1) Variations in the rate and rhythm of the fœtal heart the rate becoming either very fast or very slow. Above 160 per minute or below 100 per minute are evidences of fœtal distress.

(2) Tumultuous movements of the fœtus *in utero*.

(3) Passing of meconium unmixd with liquor amni in cases other than breech presentations.

(4) A large caput succedaneum in cephalic presentations.

We have already referred to the fact that the last is a particularly grave indication of the likelihood of white asphyxia developing after birth and even in the absence of any of the other indications we would advocate immediate delivery if a large caput is present in the interests of the child provided it is safe to do so from the mother's point of view.

Treatment—Prophylactic. This is by far the most important part of the treatment as by prophylactic measures it is possible to prevent the onset of asphyxia after the child is born. During labour the condition of the fœtus should be carefully watched from time to time, and in all cases where labour has to be assisted whether by the application of forceps or by breech extraction or extraction after version the accoucheur should be ready to treat

the child for asphyxia neonatorum if that develops. For this purpose the following articles are necessary —

- (1) A table of suitable height with a small bath tub filled with hot water in which the infant can be partially immersed.
- (2) A bucket of hot water and another of cold water to adjust the temperature of the bath water
- (3) Pieces of-gauze to swab mucus from the throat
- (4) A tracheal catheter or mucus extractor
- (5) A hypodermic syringe
- (6) Preparations of adrenalin, Scheele's fluid, lobelin, and coramine ready for hypodermic injection.
- (7) A cylinder of oxygen and one of carbon dioxide
- (8) Brandy in a small bottle
- (9) Tongue forceps
- (10) Two artery forceps and scissors, sterilised and kept in antiseptic lotion, to clamp and cut the cord immediately

The prophylactic treatment consists in terminating labour, when any of the signs of foetal distress described above manifest themselves. Immediate delivery offers the best hope of preventing the development of a severe degree of asphyxia. It may, however, be stated that such delivery presupposes that the conditions are satisfactory for the immediate delivery of the child without endangering the mother. The application of forceps, or the extraction of a breech, or in suitable cases version followed by extraction, are the ordinary methods of treatment available. Occasionally it may be necessary to resort to Dührsen's incisions of the cervix before extraction of the child, when the cervix is not fully dilated.

Curative Treatment. The following routine treatment ought to be adopted in cases where the child does not breathe immediately after delivery.

As soon as the child is born its condition should be noted, and if it is a case of blue asphyxia the probability is that gentle stimulation will prove successful in establishing respiration. If the child does not breathe after birth the throat and upper air passages must be cleared of all mucus and the cord should be tied or clamped and the baby separated from the mother. The baby is then put in a hot bath at a temperature of 115° F., so that the whole body is immersed except the head, which is carefully supported. Once the mucus is cleared from the throat the chest is gently compressed and in all probability the child will begin to breathe.

If the child does not breathe even after such efforts, artificial methods of respiration are tried, and simultaneously an injection of 3 to 5 minims of Scheele's fluid is given. This fluid consists of

One minim of liquor strychnine hydrochloride,
One minim of tincture belladonna, and
Eight minims of brandy

Instead, one of the many cardiac stimulants now available may be given intramuscularly such as coramine, $\frac{1}{2}$ to 1 c c or camphorated oil, etc

With the child immersed in the bath as described above, Sylvester's method of artificial respiration may be tried. In the majority of cases this will be quite sufficient, provided artificial respiration is attempted in a logical manner. The movements must not be repeated too frequently. Watch for spontaneous respiratory movements on the part of the foetus, and take advantage of these. Thus, the arms must be raised while the head and the lower extremities are kept stretched and immediately after the child has attempted to breathe in, the arms are brought down and compressed against the chest so as to favour prompt expiration. If the movements of artificial respiration are made to synchronise with the attempts of the foetus to inspire and expire the response will be far more satisfactory and prompt. A mechanical form of artificial respiration which does not take note of the spontaneous movements of the child will inevitably do more harm than good, as it only impedes these spontaneous attempts on the part of the foetus. Other methods of artificial respiration may be used, provided the above principle is employed whatever the method selected.

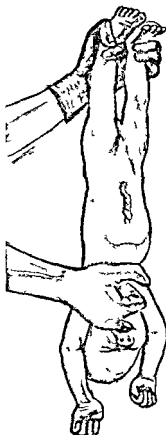


FIG 167.—Clearing the throat of mucus in an asphyxiated child

While carrying out artificial respiration the child may be given oxygen to breathe. In cases where the cardiac action is feeble adrenalin (5 to 7 minims of a 1 in 1000 solution) may be injected directly into the heart. Another drug that may be utilised is lobelin, $\frac{1}{2}$ to 1 c c, which is injected intramuscularly or occasionally into the umbilical vein.

Attempts at artificial respiration should be kept up so long as the heart beat continues. Sometimes it may have to be kept up for two or three hours, but if the child makes no attempt at respiration and if the heart beats stop, it is futile to expect that the child will revive.

A valuable aid to Sylvester's method of artificial respiration is tongue traction. The tongue is drawn out by means of a tongue

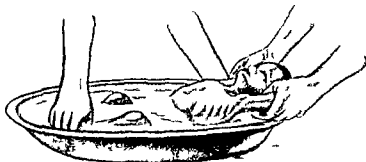


FIG. 168—Marshall Hall's artificial respiration—I stage.

forceps and allowed to recede about eight to ten times a minute. This may also be done synchronously with Sylvester's method of artificial respiration.

A method of artificial respiration that can be attempted when single handed is a modification of Marshall Hall's. The child is



FIG. 169—Marshall Hall's artificial respiration—II stage.

placed on a warm blanket spread over a table with one arm raised above its head. The obstetrician stands on the opposite side and rolls over the body of the child to the opposite side and compresses the chest. The child is then brought back to its original position. These movements favour expiration and inspiration respectively, and should synchronise with the natural attempts of the child to breathe. Simultaneously with these movements the head is kept in an extended position, the mouth and throat frequently cleared.

of all mucus and traction on the tongue applied. A few drops of brandy may with advantage be rubbed into the mouth and throat and over the chest.

Other methods of artificial respiration which were at one time in vogue are:—

Schultze's method of swinging the child over the accoucheur's shoulder so that when it is carried up the body is flexed and compression of the chest occurs, thus inducing expiration, and when the child is swung back inspiration is favoured. This is not a desirable method to employ in view of the shock that it produces, and also because of other disadvantages such as excessive compression of the abdominal viscera.

In *Byrd's method* the child is supported at the neck and buttocks, and the body is extended and flexed alternately, thus promoting inspiration and expiration. This is a method that is not advocated, in view of the possibilities of causing damage to the viscera.

Insufflation. This is a method that is occasionally adopted. It may be done either through a tracheal catheter or by direct mouth-to-mouth insufflation. The disadvantages of this method are many and it cannot therefore be recommended. Distension of the stomach with air, rupture of the air vesicles by too forcible insufflation and possible infection are some of the disadvantages.

The After-Care of the Asphyxiated Baby

It is worth remembering that an asphyxiated child which has been revived should be watched carefully for two to three days. Occasionally secondary asphyxia may develop. In many cases the lungs do not expand freely and there may be areas of atelectasis; in others small hæmorrhages have occurred in the intracranial region. The child should be kept warm, constantly watched, occasionally oxygen inhalations and stimulants may be necessary, and particular care should be taken in the nourishment of the baby.

If intracranial hæmorrhage is diagnosed as the cause of the asphyxia, the child must be handled very gently during the treatment. Any active artificial respiration or rough handling will increase the bleeding and result in death of the foetus. The child should not be bathed for several days. It is nursed with the head raised by a pillow, gr. i of chloral hydrate is given in a teaspoonful of water four-hourly if there is evidence of cerebral irritation. The child cannot suck easily. Milk withdrawn from the mother's breast must be given by a spoon or pipette.

CHAPTER XLIV

ACCIDENTS AND INJURIES TO THE CHILD

THE fœtus is subjected to great strain during the process of delivery and not infrequently accidents and injuries result. Sometimes death of the fœtus *in utero* may occur either during pregnancy or during parturition.

Death of the Fœtus during Pregnancy

The factors that may cause death of the viable fœtus during pregnancy are —

(a) Maternal factors—

Toxæmias of pregnancy

Hyperpyrexia of the mother

Syphilis

Specific fevers

Accidents to the mother such as a fall

Antepartum hæmorrhage

Certain general systemic diseases, such as diabetes chronic nephritis etc

(b) Abnormalities and diseases of the fœtus

There are cases where intra uterine death of the fœtus recurs at the same period of each pregnancy, generally between the thirty-fourth and thirty-eighth weeks. The factors responsible for this are still undetermined. Deficient fœtal oxygenation has been considered to be one factor and another some form of toxæmia of the mother. If there is such a characteristic history of death of the fœtus at the same time in repeated pregnancies it is desirable in a subsequent pregnancy to induce labour before this period of gestation is reached. In some cases the administration of potassium chlorate 10 to 15 grains three times a day, has been found useful. The drug is believed to act beneficially, by the fact that oxygen is set free which helps to properly oxygenate the fœtal blood. Where syphilis is a factor antisyphilitic treatment must be adopted.

Intra uterine death of the fœtus tends to occur near term in cases of diabetes. Where the diabetic mother is being treated with insulin the possibility of death of the fœtus *in utero* being due to a hypoglycæmic condition of the fœtus without any maternal signs or symptoms of hypoglycæmia manifesting themselves, deserves consideration.

Intra-uterine death of the fœtus may be diagnosed by the following signs and symptoms :—

Signs :—

- (1) Cessation of growth of the uterus
- (2) Fœtal heart sounds inaudible on repeated auscultation after having been heard previously.
- (3) Palpation of the soft macerated fœtal head where the cranial bones slide freely over one another.
- (4) Retrogressive changes in the breast occur, the breast ceasing to enlarge and instead becoming flabby and pendulous. A sign of some importance is secretion of milk which occurs two to three days after death of the fœtus.
- (5) Loss of weight by the mother.
- (6) X ray findings, particularly overlapping of cranial bones known as *Spalding's sign*.

Symptoms. Languor, malaise, chills, foul taste in the mouth, feeling of weight in the lower abdomen, failure to feel fœtal movements and a sense of general discomfort.

Death of the Fœtus during Parturition

The majority of still-births are due to complications during labour. Among these may be mentioned .—

- (1) Prolapse of the cord.
- (2) Placenta prævia and accidental hæmorrhage
- (3) Prolonged labour associated with uterine inertia, mal-presentations or disproportion
- (4) Difficulty in delivery or faults in the mode of delivery, in cases where assistance is required

We are convinced that not infrequently still birth is due to the last factor, either because the obstetrician has not given enough time for the head to mould through a contracted pelvis or because of faults in technique in the delivery of the fœtus. Experience is of great help in determining the time and mode of interference suited to individual cases.

Birth Injuries

During the course of delivery the fœtus may be subjected to many injuries, some of which may be insignificant, while others

are so pronounced that they either cause a still birth or favour neonatal death. Among these injuries may be mentioned —

A INJURIES TO THE HEAD

Cephalhæmatoma During the process of delivery a soft boggy swelling forms on the presenting part which becomes more pronounced in cases of prolonged labour. This is known as a *caput succedaneum* and is physiological. A type of injury that occurs in some cases is known as a *cephalhæmatoma*. It may occur during delivery with forceps or in extraction of the breech, especially



FIG. 170—Cephalhæmatoma

A Single B Double.

where there is some disproportion. occasionally it develops after spontaneous delivery. The most usual situation for a cephalhæmatoma is over one or both parietal bones. Sometimes however it may form over the occipital bone or one of the frontal bone. It does not appear immediately after birth in fact it is usually first observed some hours after delivery. It is very slow in its appearing and may take weeks to do so.

A cephalhæmatoma may be distinguished from a *caput succedaneum* by the following points —

Cephalhæmatoma

May not appear at birth, but develops a few hours or even two or three days after delivery

Is sharply limited by the sutures to a particular bone, the swelling being underneath the pericranium

Swelling is soft and elastic, does not pit on pressure

Gradually increases in size for some time and takes weeks or even months to disappear

Caput Succedaneum

Is always present at birth

Is not well circumscribed and may be present over more than one cranial bone, the swelling being in the loose tissue of the scalp external to the pericranium

Soft boggy swelling and pits on pressure

Of maximum size at birth and gradually gets smaller disappearing usually in twenty four hours

In cases of cephalhæmatoma it is advisable to treat the condition on expectant lines. Although it may take a long time,

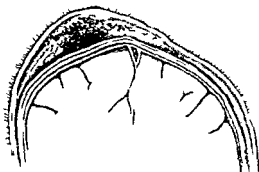


FIG. 171.—Section of the fetal skull showing the formation of caput succedaneum

sometimes months, before the swelling disappears it is not desirable to incise it as the chances of subsequent infection are great. In our experience expectant treatment has generally resulted in the gradual disappearance of the swelling and the mother should be encouraged not to be over anxious about the condition as by itself it causes no disability.

Bruises and lacerations are not infrequent over the vertex, especially in cases of forceps delivery.

Spoon shaped deformity of the skull occurs where some resistance has been offered to the delivery of the head by a protruding sacral promontory and in some cases by pressure of the tip of the blades of the forceps. These spoon shaped or gutter shaped depressions are generally over one or other of the parietal bones or occasionally over the frontal bone. The bones in the depressed area are usually fractured, but in some cases there may be simple indentation. They generally correct themselves in course of time and do not

call for any treatment unless there are signs of cerebral compression, under which circumstances surgical measures are indicated to raise the portion of depressed bone

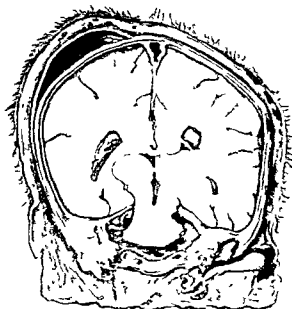


FIG 172 —Section of the foetal skull showing the formation of cephalæmatoma



FIG 173 —Spoon shaped deformity of the skull

Injuries to the Eyeball. These may be due to the faulty application of forceps, sometimes resulting even in evulsion of the eyeball or to careless vaginal examination in face presentations

roots The muscles paralysed are the biceps deltoid brachialis anticus supinator longus supraspinatus, infraspinatus rhomboides subscapularis clavicular portion of pectoralis major, serratus magnus latissimus dorsi and teres major As a result of this paralysis the arm assumes a characteristic position It cannot be flexed at the elbow, raised or abducted The movements of the wrist and the fingers are not impaired Adduction of the arm is weak and rotation is feeble or absent The sensation remains undisturbed but muscular atrophy rapidly sets in In the majority of cases, however, the prognosis is favourable as with the recovery of the nerve roots from the effects of bruising and compression



FIG 174

by the exudate the paralysis gradually disappears Proper treatment is essentially prophylactic Care must be taken during delivery of the shoulders to avoid too powerful traction on the head or excessive torsion of the neck. If paralysis has resulted the arm should be carefully bandaged to the side and massaged daily If recovery is delayed and permanent damage is likely, it is advantageous to keep the arm in a position of external rotation and abduction by means of a splint

Musculospiral Nerve Paralysis This occurs owing to the long course of the nerve its position in relation to the humerus, and its special liability to compression Injury to the nerve is followed by the dropping of the wrist and fingers It is a mixed nerve, containing sensory, motor and vasomotor fibres, but the

symptoms of the injury are almost entirely motor. In the upper arm the nerve supplies the triceps and the anconeus. In the forearm the supinators and the extensors and the long abductor of the thumb. The nerve is usually injured in the middle third of the arm by a fracture of the humerus.

Treatment consists in keeping the arm at rest with the hand dorsoflexed and massaging morning and evening.

C FRACTURE OF BONES

The bones commonly fractured are —

- | | |
|---------------|-------------|
| (1) Lower jaw | (3) Humerus |
| (2) Clavicle | (4) Femur |

Occasionally the ribs may be involved and there may be dislocation or subluxation of the shoulder and hip joints.

Fracture of the lower jaw occurs in cases of delivery of the after coming head in breech presentations when the traction is applied a little too much forward on the lower jaw.

Fracture of the clavicle not infrequently results directly from trauma during delivery of the after coming head or occasionally indirectly from pulling on the arm or the head.

Fracture of the humerus results during the delivery of the extended arms in a breech presentation or by traction on the axilla, when the shoulders are impacted after delivery of the head.

Fracture of the femur occurs when trying to bring down a leg in a case of extended breech.

With proper care none of these fractures should really occur, and when they do it is due to some faulty technique in the process of delivery. Dislocation of joints may occasionally occur on account of force exerted on the joints in the course of delivery. When fractures do occur the proper treatment for the particular fracture should be undertaken. It is advised that an orthopaedic surgeon should be consulted and the case left in his charge.

Injuries of any description generally interfere with the progress of the child during the neonatal period. Such children do not gain weight and are more prone to the diseases of the neonatal period, so that on the whole the prognosis in such cases is not so favourable.

Surgical Affections in the New-Born

Several conditions may be met with in the new born requiring surgical treatment. Some of them require immediate treatment.

while others may have to be dealt with at a later stage. The following are the more important —

- 1 Imperforate anus
- 2 Phimosis
- 3 Fracture of the long bones
- 4 Depression of the skull
- 5 Amniotic hernia and hernia into the cord
- 6 Supernumerary digits
- 7 Tongue-tie
- 8 Talipes (club foot)
- 9 Undescended testis
- 10 Harelip and cleft palate
- 11 Hydrocele and inguinal hernia
- 12 Pyloric spasm or stenosis

Imperforate Anus This condition is met with occasionally and requires in most cases immediate surgical aid. Four types of imperforate anus may be met with.

(1) Here there is a stenosis of the anus due to an incomplete rupture of the anal membrane. The condition is relieved by repeated dilatation of the anal canal.

(2) In these cases the obstruction is due to a persistence of the membrane at the anal orifice. A crucial incision into the membrane with subsequent dilatation for a few days cures the condition.

(3) In these cases the anus is absent but there is a pouch of the rectum which may be within 1 to 4 cm. of the anal dimple.

(4) Here the anal opening and the lower rectal segment are normal but the descending segment of the rectum ends blindly 2 to 4 cm. above the anus.

In the third and fourth groups it is well to wait for twelve to sixteen hours after birth to allow the meconium to distend the lower bowel and the rectal pouch. The child is placed in the lithotomy position and a perineal incision is made through the site of the anus and carried upwards and backwards along the concavity of the sacrum strictly in the middle line for not more than 2 inches. In favourable cases the distended pouch with meconium will be met with. This cul de sac is drawn down as far as possible and opened into towards its posterior aspect. The mucous membrane is then if feasible stitched all round to the skin so as to leave no surface to granulate thereby preventing subsequent stenosis. Where no rectum is present or where the cul-de-sac is not reached iliac colostomy must be performed. In those cases where abnormal openings into the bladder or vagina are present once a passage for the feces is established through the normal channel such openings usually close spontaneously without difficulty.

In female infants however if the rectum opens into the vagina and the opening is sufficiently large to allow of free passage of meconium and fæces no immediate operation is necessary. An operation can be subsequently performed when the child is much older.

Phimosis In the new born male phimosis is to a certain extent a physiological condition. Slight adhesions are always present between the glans and the mucous membrane which gradually loosen in the course of the first few months. If however there is too long a prepuce or too narrow an opening it requires operative treatment. Neonatal circumcision may be performed and the best results are obtained by a more or less simple procedure. It is important to remember that the mucous membrane should not be unnecessarily removed. The frenal artery is thus avoided and the sensory nerve endings at the frenum are preserved. To get this result the adhesions between the foreskin and the glans are first broken up with a probe & a circumcision guard is slipped on obliquely and the excess skin removed by scissors. Careful retraction of the mucous membrane is then made and after putting in three or four fine catgut sutures to approximate the mucous membrane and the skin a dressing is applied.

Fracture of the Long Bones—It has already been stated that among the injuries met with in the new born are fractures of the bones in particular the clavicle the humerus the femur and occasionally one or other of the ribs. Fracture of the clavicle and separation of the upper epiphysis of the humerus occur most often in breech deliveries complicated with extended arms. Immediate fixation is the proper treatment of all these shoulder injuries. A simple wire splint may be utilised for this purpose. The arm is placed and maintained in an elevated position for a few days.

As regards fracture of the long bones the essential principle of treatment is fixation and treatment in an attitude that best maintains the fragments in position. It is well to remember that union of fractured bones in the new born is so rapid that it is only necessary to immobilise the bones for a few days instead of for weeks as in adults.

Depression of the skull should be treated by gentle counter pressure or by elevation of the bone with one blade of a single tenaculum forceps. The bone is most easily raised immediately after birth.

Amniotic Hernia and Hernia into the Cord Congenital anomalies at the umbilicus are not infrequent. Hernia into the umbilical cord may sometimes persist after birth. The umbilical opening of such a hernia is relatively narrow and thus together with the presence of adhesions may make reduction difficult or impossible. In amniotic hernia there is an absence of the abdominal wall

around the umbilicus the defect being replaced by amnion reflected from the cord over the abdomen and lying directly upon the peritoneum. The sac may contain the small and large intestines and even the liver. Amniotic hernia does not interfere otherwise with the development of the fœtus. But the only chance of the survival of the infant except in cases of small deficiency, lies in an immediate operation for radical cure of the hernia.

Supernumerary digits do not ordinarily call for any treatment. In cases where a digit hangs by a thin pedicle a ligature of silk worm gut may be applied and the pedicle allowed to separate.

Tongue tie. This defect is not noticed till a few months after birth when difficulties are experienced either in articulation or in the free movement of the tongue for other purposes. The frenum may be snipped taking care not to injure the vessel and the tongue thus freed.

Talipes. This is a not infrequent deformity met with and in most cases if treated from birth with daily massage and manipulations the milder cases respond and plaster splints and tenotomy may often be found unnecessary. In the more severe cases and in neglected cases surgical treatment with plaster splints are required.

Undescended Testis. The testes descend into the scrotum from the abdominal wall at about the eighth month of intra uterine life. The gubernaculum testis assists in this process. The descent of one testis may however be incomplete. It may remain in the abdominal cavity most frequently being found just within the internal abdominal ring. The most common variety of undescended testis is where it occupies the inguinal canal or lies just outside it. It is easily recognised by the absence of the testicle in the scrotum and when present in the inguinal canal the testis can usually be detected as a small movable swelling with the scrotum on the affected side imperfectly developed.

Treatment of this condition may have to be undertaken at a later period when the child is between the ages of six and twelve years and consists in either the administration of endocrines or operation.

Harelip and Cleft Palate. These are congenital malformations of the upper lip and the bony alveolus. They may be unilateral or bilateral. A simple harelip does not interfere seriously with the infant's nutrition but when double and especially if cleft palate is also present considerable trouble may arise necessitating surgical treatment as a life saving measure at a very early date. Except in those cases where surgical treatment is imperative to allow the child to take its nourishment the usual time when an operation is performed is between the ages of six months and two years. Occasionally the defect of a cleft palate may temporarily be relieved

by means of a plate fixed to the under surface of the palate so that the child may suckle or be given nourishment

Hydrocele and Inguinal Hernia These are not infrequent and it is well to undertake surgical treatment when the child is a few months old

Pyloric Spasm or Stenosis of the Pylorus This condition may be met with in infants. It is usually associated with congenital hypertrophy of the pylorus and is probably due to prenatal causes. It occurs more frequently in male children and the pylorus is transformed into a solid cylindrical mass about one inch in length pale in colour and sometimes of cartilaginous consistency. It may be difficult to palpate as it often lies behind the liver but the only certain diagnostic sign of this condition is its recognition by palpation. Symptoms commence within two or three weeks of birth. After taking food there is not much evidence of pain although the child may appear to be uncomfortable and relief is obtained by vomiting of a projectile type. Little food appears to pass into the intestine so that constipation is marked and the child soon wastes. The stomach becomes enlarged and after a time visible peristalsis occurs.

Treatment Medical measures such as lavage and dieting are only of use during the stage when the diagnosis has not yet been finally arrived at. After this the only rational treatment is surgery. The operation that is now performed is known as Rammstedt's operation. The pylorus is brought to the surface through a short paramedian incision about $1\frac{1}{2}$ ins in length the pyloric sphincter is divided longitudinally throughout its length, the incision reaching well on to the stomach where the muscular fibres shed off, but very cautiously towards the duodenal end. The mucous membrane may project and is liable to be wounded when the incision is completed. The mucous membrane projects into the gap as a hernial protrusion and is left in this condition. Shock is likely to be severe and must be suitably combated. The results of this operation are excellent. An abundant supply of saline solution is given both before and after the operation which is performed under a local anæsthetic.

Inflammatory Affections of the Breast

These are not infrequent in puerperal women especially in anæmic and weak women and usually result from a cracked nipple through which pyogenic organisms find their way into the lymphatics or acini of the breast substance. If through the lymphatics the inflammation is mainly interstitial in character, the pus diffusing itself widely between the lobules. In the other variety the pus is primarily intra alveolar.

Signs and Symptoms The breast becomes swollen acutely painful and tender. The gland lobules are enlarged and indurated and if suppuration is progressing lactation is to some extent impaired. Owing to the inability of the other to allow the child to be nursed considerable tension results from accumulation of milk. If suppuration follows the skin over the breast becomes red and cedematous and according to the situation of the pus three different forms of abscess may result —

- (i) *Supramammary abscess* where the pus collects in the subcutaneous tissue or beneath the nipple. It is often unconnected with the breast proper and comes readily to the surface.
- (ii) *Intramammary abscess*. This is the commonest variety the pus developing within and distending the lobules. It may sometimes produce gangrene of the glandular tissue.
- (iii) A *submammary abscess* may form in the cellular tissue beneath the breast.

Treatment of simple acute mastitis consists in supporting the inflamed gland by means of a sling or bandage and binding the arm to the sides. fomentations are applied any tension due to retained secretion of milk is relieved by the breast pump the bowels are opened and the patient placed on a light nutritious diet. If the condition subsides belladonna ointment may be painted on as it often helps in the resolution. If however the part remains hard and swollen with severe pain and temperature suppuration is obviously threatening. One should not wait for the appearance of fluctuation before opening an abscess as in some cases a great deal of the breast substance is destroyed before any distinct fluctuation can be appreciated. Persistent œdema under such circumstances is quite a sufficient indication to warrant operation. In the supramammary variety it matters little in which direction the cut is made since the pus is always superficial to the breast tissue. In the true intramammary abscess the incisions should radiate from the nipple. One or more may be needed and these should be freely made so as to allow of the insertion of a finger to open up any pockets or lobules which are distended with suppurating material. A drainage tube is inserted for a time and gradually shortened. When the chief incision is needed above the nipple it is wise to make a counter-opening in the lower half of the breast and generally on the outer side to permit of efficient drainage. A submammary abscess is best opened towards the lower and outer side and also at any spot where pus points.

Not infrequently inflammation of the breast is due to the unskilful administration of saline subcutaneously. If the saline is given too hot or is allowed to flow into the breast substance, instead of into submammary tissues, the breast becomes inflamed, suppurates, large sloughs may form, and in severe cases the whole of the breast substance may be involved in a gangrenous inflammation. It is necessary, therefore, to be cautious in the administration of submammary saline, to see that it is given underneath the breast into the loose areolar tissue. The saline should be properly sterilised, or at least boiled water should be used in the preparation of the solution in cases of emergency, and the temperature of the solution should be carefully regulated.

SECTION III OBSTETRIC OPERATIONS

CHAPTER XLV INTRODUCTION

It may not be out of place to sound a note of caution at the commencement of this chapter and define what the attitude of the careful obstetrician should be when a patient in labour is committed to his charge. Pregnancy is a physiological process and parturition should also be a physiological act, but certain unfortunate accidents are liable to occur. The obstetrician will do well to realise that nature if left alone, can overcome many minor difficulties successfully and with a minimum of risk, and so he should allow the process of labour to be completed spontaneously if possible. The attitude of the obstetrician has been well defined as one of 'matterly inactivity,' and nowhere is it more necessary than in the field of operative obstetrics to keep prominently before one's mind the watchword 'never interfere unless for a definite indication.' Whatever the precautions taken, however well qualified and skilful the operator may be, the obstetrician can never compete with nature in effecting a safe delivery. His active participation is strictly limited and will become less frequent with increased experience. Too often unfortunately, the obstetrician is forced by the importunities of the patient or her relatives, or because of his own multifarious duties to accelerate the pace of delivery, and in every such case his experience must make him realise the occasionally disastrous consequences that result from such inopportune interference.

In another direction a word of caution is also necessary. Nowhere than in the field of obstetrics is there a greater need to keep cool and avoid hurrying the process of labour. An equable temperament, resource and presence of mind, a calm outlook and steady habits are a *sine qua non* for the success of any obstetrician. In no branch of medicine is there a greater demand for sacrifice of personal comforts and for prompt response to a call, irrespective of the time or the distance, than in the field of obstetrics, and it is well that the young practitioner should realise before taking up this speciality what demands will be made of him in the sacrifice of his personal pleasures and social obligations.

We shall now consider what the attitude of the obstetrician should be when contemplating an operative delivery. He should always ask himself, whenever confronted with a case which possibly requires obstetrical interference, the following three questions —

- (1) Does the patient require obstetrical interference?
- (2) Does she require immediate interference?
- (3) If she does require interference what is the nature of the interference she requires?

On a satisfactory answer to each of these questions depends the success of the obstetrician.

Does the Woman require Interference? The answer to this question is obvious. There are only two indications for obstetrical interference during labour. It is undertaken either in the interests of the mother or in the interests of the child. Occasionally it is on behalf of both. Rarely one may have to interfere on account of foetal distress although this may lead to some degree of increased risk for the mother. The following are examples. A patient is seen at the thirty-sixth week of pregnancy with a history of bleeding. The necessity for interference here is obvious. The bleeding must be arrested to save the life of the mother and in some cases perhaps it will also save the life of the foetus. Again the indications may be both for the mother and the foetus and the case of a woman who is showing strain from a prolonged labour is one in point. Here the mother is exhausted or may be in imminent risk of rupture of the uterus and signs of foetal distress are also evident. The sooner delivery is completed the better for the mother as well as the child. Another type of case is where the indication for interference is primarily on behalf of the child. A patient in labour is found to have a prolapsed pulsating cord with a cephalic presentation. The interference in this case is primarily for the sake of the foetus, and occasionally the method adopted may necessitate an added but justifiable risk to the mother which is of course only undertaken after due consideration of all aspects of the case. It is often true that in such a case if labour were allowed to continue, the patient would deliver herself spontaneously but with the certainty of a still birth. The duty of the obstetrician has been clearly defined as the delivery of a living child with a mother as little damaged as possible in consequence of the delivery and it is no satisfaction to any obstetrician that the mother is safe but the foetus is born dead. The responsibility of the obstetrician is therefore frequently immeasurably greater than that of a physician or a surgeon, it is here that the greatest amount of judgment and care are required in weighing up the respective interests of mother and child, in giving due consideration to either or both

and in coming to a wise decision as to the most appropriate method of treatment to be adopted

Does the Patient require Immediate Interference? This is another fundamental question to be asked by the obstetrician. More damage has been done than ever can be assessed by precipitate or premature interference. It is here that experience proves such an asset, but where this is lacking as it must be in the case of junior practitioners, it is all the more necessary to consider whether the stage has now been reached when such interference is essential. The following illustrates the point by a concrete instance. A multigravida is seen in labour with the breech presenting and in the pelvic cavity. The cervix is about three fingers dilated. This patient may require assistance at some stage of labour, but the question is when to afford such assistance. Any premature attempt to extract the breech before full dilatation of the cervix will lead to disastrous consequences both for the mother and for the child and therefore while the question does she require interference may be answered in the affirmative, immediate interference is not called for. Often owing to a slight disproportion or to a deflexion attitude of the head, or to other maternal causes such as anæmia, albuminuria, etc. one may be inclined to the view that the woman in labour may require assistance. Such assistance should however never be given till the question does she require immediate assistance, is answered in the affirmative. Such is only required when definite indications have arisen to show that the mother or the child is in distress or there are present signs of certain risk to the mother, unless she is promptly delivered, such as in cases of valvular disease of the heart, anæmia, certain degrees of toxæmia, or after exhausting illnesses, etc.

The third question, *What sort of interference is necessary?* also requires very careful consideration. Many factors have to be taken into account in deciding this question. The first point to be decided is whether delivery should be by the abdominal or the vaginal route, it is not always easy to decide this question, hence the necessity for test labours. When the vaginal route of delivery has been selected the nature of interference will depend upon the presentation and position of the foetus, the condition of the uterus, the condition of the cervix, the general condition of the patient, the patient's environment and the extent of assistance available including the experience and skill of the obstetrician in attendance. In many instances there is more than one method of treatment possible and in such circumstances considerable judgment is required to decide which should be adopted. Let us take for instance the question of the treatment of placenta prævia. Here both routes of delivery are open to us—the abdominal as well as the vaginal. In one set of cases the abdominal method may be

the better, in another the vaginal, and as regards the vaginal route some obstetricians may use a Willest's forceps while others employ a Champetier de Ribes' bag, and others again perhaps a smaller group select a vaginal Cesarean section. It is essential that all the accessory factors, such as surroundings, assistance available and experience of the operator should be taken into consideration. We cannot too strongly emphasise that it is not open to every obstetrician to adopt some of the methods that may be suggested for the treatment of different obstetrical emergencies. It is no use ignoring the fact that some methods are more suitable for institutional treatment and others for domiciliary practice, some again are safer for junior practitioners to employ while others more difficult and complicated give brilliant results in the hands of experienced obstetricians.

The Ideal Environment in which to perform an Obstetrical Operation

Unfortunately, while every obstetric operation is a surgical procedure and should therefore be practised with all due asepsis and anti-sepsis the obstetrician is sometimes committed or at least expected to do difficult and complicated operations in surroundings where no surgeon would undertake a case of like gravity. It is nowadays unthinkable for a surgeon to perform an appendicectomy in crowded surroundings with the kitchen table improvised as an operating table, with no assistant to administer the anæsthetic and with little or no adequate help. It may yet be a distant cry for the obstetrician to ask for all those amenities which a surgeon insists upon before starting an operation—a perfect obstetrical organisation because of numerical, geographical and economical considerations is difficult to visualise. Yet it is well to remember that from the point of view of the patient's safety there is no difference between an obstetric and a surgical operation and that both require the same rigorous care in technique, preparation of the patient and after treatment. If this ideal were kept in view it is obvious that the scope for operative delivery in domiciliary practice would be increasingly limited. We are of opinion that it is not justifiable, except in circumstances where there is no other option for any of the major obstetrical procedures to be performed in the houses of patients. We would limit the scope of operative delivery in domiciliary practice to the application of low forceps and occasionally to the extraction of a breech or the repair of a lacerated perineum. We have already indicated that cases of placenta previa or eclampsia and difficult labour associated with contracted pelvis should whenever possible be dealt with in institutions.

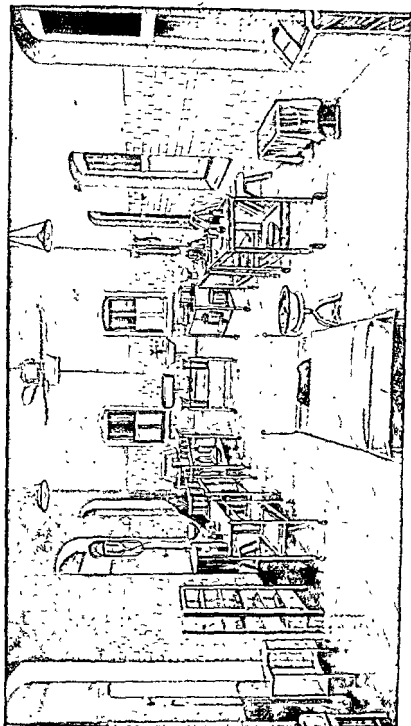


FIG. 175.—The Operative Delivery Room attached to the Labour Ward. Note the position of the Delivery Board (A) and the different accessories arranged in order.

the instruments should be sterilised or well washed with soap and water and carbolic lotion or flamed with rectified spirits. Rubber instruments can be satisfactorily sterilised by boiling, swabs sponges and dressings should be sterilised by high pressure steam and kept ready for use. *Sterile ligatures should always be available such as silk silkworm gut catgut and linen thread.* The operator and the assistants after preliminary cleansing and disinfection of their hands must wear sterile caps masks gowns and rubber gloves.

Preparation of the Patient

This is also most important and must be attended to with care. The pubic region should be washed and shaved and then painted with an antiseptic solution thereby thoroughly cleansing the vulva and the surrounding parts. After drying the parts with a sterile towel an antiseptic should be painted over the whole region of the vulva including the upper portion of the thighs the perineum and the surrounding areas and the lower part of the anterior abdominal wall. *Different antiseptics are used for this purpose such as tincture of iodine mercurochrome violet green and dettol solution.* The question of giving a vaginal douche is sometimes raised. A vaginal douche is unnecessary and occasionally even harmful and it is not wise to adopt it as a routine measure during operative midwifery. Where the vagina is possibly infected we prefer to swab the cavity with the same antiseptic used to sterilise the skin. Whatever be the care bestowed in the preparation and toilette of the vulva and vagina it must be realised that owing to the proximity of the anus to the genital passage great care is required when making vaginal manipulations so as to avoid possible contamination of either the fingers or instruments during the process of their introduction. The bladder and the rectum should be emptied before the obstetric operation is performed. It is easy to empty the bladder by passing a male metal catheter and this

The history of the invention of the obstetric forceps and its subsequent development is interesting and the reader is referred to the detailed account given in *The History of the Obstetric Forceps* by Sir Kedarnath Das

The obstetric forceps consists of two blades, which cross each other and are called the left or lower blade, and the right or upper blade according to the side of the pelvis to which they are applied. Each blade is made up of four parts—the fenestrated blade proper, the shank, the lock and the handle. In some types there is in addition a traction handle. Each fenestrated blade possesses two curves—a cephalic curve which enables the blade to be applied closely to the cephalic pole of the fœtus, and a pelvic curve which enables it to be introduced and lie more or less in the axis of the parturient canal. The two blades articulate at the lock which may be of the English type or the French type. The English type is the simpler and more efficient of the two and allows the shank of one blade to slip into the socket of the other. In the French lock a pivot is screwed into the shank of the left blade, while in the right blade there is a notch which can be adjusted to it the screw being tightened after locking the blades. One of the most striking advances in the evolution of the obstetric forceps is the invention of axis traction by Tarnier in 1877, and it may be said that since that date no great improvement has really been effected upon this instrument.

The common forms of axis traction forceps now in use are the improved Tarnier's, Milne Murray's axis traction forceps, and Neville's axis traction forceps. It is a matter of personal taste which particular form of axis traction forceps is used. We prefer the Milne Murray's axis traction forceps as we find it suitable for all types of forceps delivery.

The Choice of Forceps. The obstetrician cannot be too careful in the choice of an obstetric forceps. We regret to state that in this connection unfortunately, owing to the tendency for mass production of instruments there has been a considerable deterioration in the standards that ought to be maintained in the manufacture of such an important instrument. We have had reason to condemn instruments supplied by manufacturers owing to defects in the shape, size, method of articulation or general make up of the instruments and it is unfortunate that such instruments may come into the hands of a junior practitioner as his difficulties are considerably increased thereby. It is well therefore to test each instrument and make sure that it is properly finished, that it conforms to particular measurements, that it locks properly, that the axis traction rods do not slip out easily, that the traction handle can be applied without much difficulty, and that it is made entirely of metal and well annealed. To test whether

the forceps satisfies the requirements it is well to note certain measurements—the maximum distance between the two blades should not exceed 7.5 cm. or 3 ins. when the forceps is articulated.

The distance between the tips should be 2.5 cm. (1 in.)

The cephalic and pelvic curves should be of proper proportion.

When the forceps is placed upon a plane the tips of the blades should be about 8.8 cm. (3½ ins.) higher than the handles.

An instrument made of stainless steel is the best, but if the model is silver plated it must be reconditioned before further use if the plating is peeling off.

The forceps ordinarily available in the market is a little too heavy and too large to suit the requirements of the short-statured Indian women. For this reason Kedarnath Das has patented a forceps—the Das Calcutta forceps—which is much lighter and smaller and is specially suitable for use in India. We have used this forceps in selected cases and have found it satisfactory.

Action of the Forceps It is customary to state that the forceps has several actions. It may act as (1) tractor, (2) rotator, (3) compressor, (4) lever, (5) dilator and (6) stimulator of uterine contractions. But we think it is a mistake to describe some of these as actions of the forceps for the forceps was never intended to be used for this purpose in obstetric practice. To state for instance that the forceps can act as a compressor of the foetal head or as a lever or stimulator of uterine contractions or as a dilator, is entirely unwarranted for this reason: the forceps should never be put to such uses. The main action of the forceps is traction, a subsidiary action used in selected cases and with due precaution is rotation.

In speaking of the forceps as a tractor it should be clearly understood this function has definite limits. It supplies the *vis a fronte* that is necessary in suitably selected cases to deliver the woman without damage either to the foetus or to herself. To be under the impression that once the forceps has been applied all that is now necessary is to apply the maximum amount of traction to get the head delivered is entirely wrong and its practice will certainly lead to disastrous consequences. It is not strength that is needed in the application of traction by the forceps but the skilful use to the best advantage of a limited amount of force.

As a rotator the forceps must be used with care. In certain cases of occipito-posterior positions, particularly in those cases where the occiput has incompletely rotated to the front, the forceps can if used with care help to rotate the occiput towards the symphysis pubis. We have noticed that if light traction is applied there is a tendency for the forceps to rotate and this tendency can be amplified thereby helping in the forward movement of the occiput. It is not necessary that the forceps should

be rotated through the whole arc of a circle as even with light traction the head turns with the forceps and becomes an occipito anterior

The question of the use of the forceps as a rotator in mento posterior cases is more debatable. But even here it is justifiable in cases where the only alternative is craniotomy to consider the desirability of attempting judicious rotation so that no serious damage may occur to the maternal soft parts. When the forceps is applied to the head a limited amount of compression is inevitable but the forceps as already stated should never be used for the express purpose of compressing the head and thus reducing its size so that it may pass through a somewhat contracted pelvis.

The lever action of the forceps also is not to be considered a justifiable function as there is grave danger of lacerating the soft parts. In former years an instrument known as the Vectis which roughly resembled one blade of the forceps was used as a lever particularly in certain varieties of occipito posterior position. The instrument is no longer included in the obstetrician's bag.

With the improved facilities now available for stimulating uterine contractions it is out of the question to think of utilising the forceps for this purpose. Lastly the forceps should never be used for dilatation of the birth canal as serious lacerations are bound to result. In fact it will be stressed later than one of the essential conditions for application of forceps is full dilatation of the cervical canal and if this is not present other methods of dilating the genital passages must be resorted to before application of forceps. We may therefore repeat that the functions of the forceps should

to the convulsive movements of the second stage of asphyxia in the adult

(4) Prolapse of the cord is a sign of grave danger to the child as it is likely to be compressed by the presenting part and the foetal circulation thus arrested

(5) A large caput succedaneum in a vertex presentation

We lay great emphasis on the last of these indications because we are convinced that even in the presence of a foetal heart of moderate intensity and a rate within physiological limits the presence of a large caput is indicative of impending distress. A large caput means prolonged and continued pressure of the foetal skull and its contents and eventually the most delicate areas the floor of the fourth ventricle where the vital centres are situated become involved. Experience has shown that the respiratory centre is more easily paralysed and earlier than the circulatory centre so that a large caput generally results in paralysis of the respiratory centre before the circulatory centre shows any variations in the foetal heart rate. After delivery it is not uncommon to notice that while the umbilical cord goes on pulsating for a fairly long time the child makes no attempts at respiration.

Signs of Maternal Distress In a large number of cases the signs of maternal and foetal distress occur simultaneously but sometimes signs of maternal distress may alone warrant interference even though there are no signs of foetal distress.

Certain diseases of the mother justify the use of forceps because they predispose to the early development of maternal distress. Examples of such are valvular disease of the heart with or without decompensation toxæmias of pregnancy antepartum hæmorrhage pulmonary diseases like pneumonia advanced tuberculosis pulmonary oedema etc. and exhausting illnesses which make it desirable that the second stage of labour should be shortened as far as possible.

In a few cases even though there may be no absolute indication of distress either of the mother or the foetus it may be necessary to apply forceps and terminate labour to avoid the onset of distress. If the second stage of labour has lasted for some time and there is no advance and if the conditions for the safe application of forceps are fulfilled there is no object in allowing the head to remain indefinitely in the pelvic cavity compressing the maternal soft parts and thus increasing their liability to infection and sloughing as well as prolonged overstretching.

If exhaustion of the mother from such a prolonged labour has developed it forms another indication for interference.

We stress again however that the indications are essentially limited to these two fundamental conditions namely maternal or foetal distress.

to the convulsive movements of the second stage of asphyxia in the adult

(4) Prolapse of the cord is a sign of grave danger to the child as it is likely to be compressed by the presenting part and the foetal circulation thus arrested

(5) A large caput succedaneum in a vertex presentation

We lay great emphasis on the last of these indications because we are convinced that even in the presence of a foetal heart of moderate intensity and a rate within physiological limits the presence of a large caput is indicative of impending distress. A large caput means prolonged and continued pressure of the foetal skull and its contents and eventually the most delicate areas the floor of the fourth ventricle where the vital centres are situated become involved. Experience has shown that the respiratory centre is more easily paralysed and earlier than the circulatory centre so that a large caput generally results in paralysis of the respiratory centre before the circulatory centre shows any variations in the foetal heart rate. After delivery it is not uncommon to notice that while the umbilical cord goes on pulsating for a fairly long time the child makes no attempts at respiration.

Signs of Maternal Distress In a large number of cases the signs of maternal and foetal distress occur simultaneously but sometimes signs of maternal distress may alone warrant interference even though there are no signs of foetal distress.

Certain diseases of the mother justify the use of forceps because they predispose to the early development of maternal distress. Examples of such are valvular disease of the heart with or without decompensation toxæmia of pregnancy antepartum hæmorrhage pulmonary diseases like pneumonia advanced tuberculosis pulmonary œdema etc. and exhausting illnesses which make it desirable that the second stage of labour should be shortened as far as possible.

In a few cases even though there may be no absolute indication of distress either of the mother or the foetus it may be necessary to apply forceps and terminate labour to avoid the onset of distress. If the second stage of labour has lasted for some time and there is no advance and if the conditions for the safe application of forceps are fulfilled there is no object in allowing the head to remain indefinitely in the pelvic cavity compressing the maternal soft parts and thus increasing their liability to infection and sloughing as well as prolonged overstretching.

If exhaustion of the mother from such a prolonged labour has developed it forms another indication for interference.

We stress again however that the indications are essentially limited to these two fundamental conditions namely maternal or foetal distress.

Causes which may necessitate the eventual Application of Forceps. Among this group may be mentioned:—

- (1) Faults in the passages
- (2) Faults in the passenger.
- (3) Faults in the uterine forces.

Some obstetricians group these under indications for forceps application, but we feel that whatever these faults may be, unless distress of the mother or the fœtus develops, the question of the application of forceps does not arise. The factors which may finally bring about signs of fœtal or maternal distress, and thus necessitate the application of forceps, may be connected with the passages, passenger or powers.

(1) *Faults in the Passages.* These faults may be either in the bony canal or in the soft parts. Minor degrees of disproportion by prolonging the first and second stages of labour may result in the appearance of fœtal distress and so forceps may have to be applied to effect delivery as quickly as possible. We have already stated that the forceps should not be used as a compressor, and its place therefore in the management of labour in contracted pelvis is strictly limited to traction of the head after moulding has permitted it to pass the obstruction, but labour cannot be terminated spontaneously within the period of time necessary for the safety of the fœtus or the mother.

So far as the soft parts are concerned, obstruction by them should never be overcome by forceps except at the vaginal outlet. Where the head is delayed in its progress, especially by rigidity of the perineum, forceps is justified. This condition is more likely to be met with in muscular women or elderly primiparæ.

(2) *Faults in the Passenger.* This may be due to malpresentations or malpositions, or to certain defects of the head. Thus, in occipito-posterior positions, in brow, face, and generally in cephalic presentations with moderate degrees of deflexion, the forceps may be

Difficulty in the delivery of the after coming head in breech presentations may occasionally necessitate forceps

(3) *Faults in the Uterine Forces* For a vaginal delivery to terminate successfully the uterine contractions must generally be sufficient to force the head through the pelvic canal. The uterine contractions however, may be weak or inefficient and sometimes they may be completely absent. In this last condition the application of forceps is contraindicated, and even when they are weak or ineffective it is desirable if possible to stimulate the uterine contractions before considering the termination of labour by forceps.

Forceps has commonly to be applied when the head comes to what is known as the "sticking point". The curved path which the head has to take during its passage through the pelvic canal presents most difficulty low down in the pelvis for the head has to emerge in a direction practically at right angles to that in which it engaged and passed through in the brim of the pelvis. If the force of uterine contractions is not sufficient to push the head past this sticking point it may remain in that position and the uterus becomes exhausted the contractions become gradually weaker and weaker and the head may be pressing on the perineum for a considerable time unless help with forceps is available.

Conditions to be satisfied before the Application of Forceps The obstetric forceps should never be used unless certain definite conditions are present which make their application safe. These are —

- (1) The cervix must be fully dilated
- (2) The uterus must be contracting
- (3) The membranes must be ruptured
- (4) The presentation should be a cephalic presentation
- (5) The head must not be too large or too small
- (6) The greatest diameter of the head should have passed through the brim of the pelvis and there must be no serious disproportion between the foetal head and the pelvis
- (7) The bladder and rectum must be empty

The head should be in a suitable attitude and correspondingly suitable position i.e. fully flexed with the occiput anterior or fully extended with the chin anterior. Preliminary manual manipulation may be necessary to establish these conditions for example manual rotation of a persistent occipito posterior position of the vertex.

Full Dilatation of the Cervix One of the most important points to be emphasised is that the cervix must be fully dilated before forceps is applied. Sometimes where immediate delivery is

indicated and the cervix is not fully dilated forceps may be used provided the dilatation is first completed manually. The necessity for this rule is that serious tears of the cervix are bound to occur and the lacerations may extend up into the lower uterine segment, if the forceps is applied before dilatation is complete. The dangers of such extensive lacerations are obvious as the uterine vessels may be involved or the peritoneal cavity opened and besides the immediate shock and severe hæmorrhage which result sepsis and sloughing of the parts are almost certain to develop later.

The Membranes must be Ruptured This is a condition easily fulfilled and indeed in the large majority of cases there is no necessity to consider a forceps application before rupture of the membranes has taken place. Very rarely does the child become distressed while the membranes are still intact and when signs of foetal distress do manifest themselves with intact membranes it is desirable to rupture the membranes and watch the case for some time before preparing for a forceps delivery.

Should the forceps be applied with the membranes intact the chances are that the instrument will slip owing to the smooth surface of the membranes and if traction is still applied premature separation of the placenta with serious bleeding may ensue.

The fœtus should be presenting either as a vertex or as a face, and it is necessary before the forceps is applied that the position should be accurately diagnosed. The forceps should never be applied either to a breech or a shoulder presentation nor should forceps be used in a brow presentation unless it has been first changed into a vertex or a face. The forceps can be successfully applied to the after coming head in a breech presentation and this method is becoming very much more popular.

The Head must not be too Small This condition should be borne in mind for two reasons. With a small head the forceps would tend to slip secondly there are greater chances of damage to the brain by the application of an instrument like the forceps in a small premature infant. It is therefore better to avoid this mode of delivery in such cases should interference be called for.

The Uterus must be Contracting This is an important condition. The delivery of a child when the uterus is in a state of inertia favours the occurrence of severe atonic postpartum hæmorrhage and the obstetrician should never undertake forceps application till the uterus has first been stimulated to contract.

The forceps should generally be applied when the *greatest diameter of the head has actually passed through the brim*. Further, there should be no serious disproportion between the head and the pelvis. If the head has not passed through the brim after or before moulding the application of forceps is not the suitable method of delivery.

There are two ways of applying forceps —

- (1) The cephalic method and
- (2) The pelvic method

In the *cephalic method* the blades are so applied that they are in accurate apposition with the sides of the head with an ear in the centre of each fenestra. This causes compression in the biparietal diameter where it does the least harm also with a cephalic grip the blades fit much better and do not tend to slip. To do this successfully requires a careful appreciation of the position of the foetal head with reference to the pelvis and the accurate adaptation of the blades to the sides of the foetal head irrespective of its position in relation to the maternal pelvis.

In the *pelvic method* the blades are applied with reference to the maternal pelvis one being placed on the right side and the other on the left side. Although easier technically the disadvantages of the pelvic grip are that the forceps may slip if the head has not

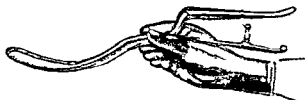


FIG. 16.—Forceps application. Method of holding the left or lower blade before application.

rotated so as to bring the occiput underneath the symphysis pubis and that the grip of the forceps on the foetal head may cause some damage to it. Occasionally it has led to injuries to the eyeball or some soft part of the foetal head. Further this method is more prone to cause intracranial hemorrhage as pressure is applied to the foetal head in a much less favourable diameter.

When the head has rotated completely into the antero posterior diameter of the outlet and a low forceps operation is employed to extract the head the grip is both cephalic and pelvic. This is the operation now described.

Introduction of the Blades. With the patient anaesthetised and the parts carefully prepared the operator sits on a stool of convenient height and after having emptied the bladder by passing a catheter takes the left or lower blade in his right hand. He introduces two fingers of his gloved left hand into the vaginal cavity on the right and posterior quadrant of the pelvis so that the palmar surface of the fingers are looking upwards and to the left. The lower blade is lightly held with the axis traction rod in intimate contact with the handle in the right hand as one would hold a spoon. The tip of the blade is held at right angles to the

palmar surface of the fingers in the vagina and gently slipped along the fingers into the vaginal cavity, first as a posterior blade, and then when the whole of the cephalic portion of the blade has been introduced it is gently rotated laterally to make it the left blade. The two fingers passed into the vagina are to direct the blade of the forceps along the vagina and to see that the blades are introduced within the cervical canal in close apposition to the head. It is not necessary to introduce the half hand into the vagina for slipping in the blades of the forceps. We hold further that the introduction of the half hand very often pushes the presenting part upwards and thus converts a low forceps into a mid forceps and a mid forceps into a high forceps. That the

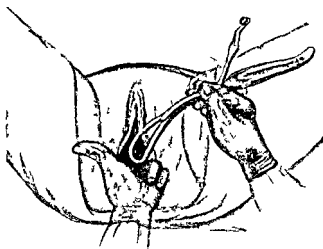


FIG. 177.—Forceps application. Method of introduction of the left blade.
Note the two fingers in the vagina.

lower blade has been correctly applied can be verified by pressing the handle well against the perineum when if the handle is seen perfectly straight without any slight tilting to one side or other, it can be presumed to have been properly applied. Should the lower blade have been applied properly it will rest there and not tend to slip out. An assistant may, if necessary, lightly steady the handle in this position. The operator then removes his left hand, immerses it in lotion and introduces the same two fingers but this time above and to the right nearer the symphysis pubis so that the palmar aspect of the two fingers is facing downwards and towards the left. The right blade is taken in the right hand, the handle being gripped and the axis traction rod made to rest lightly on the knuckle of the mid finger. The blade is now held parallel to the mother's abdomen, the tip being pressed against

the palmar aspect of the two fingers and by gently rotating through half a circle the cephalic portion is gradually inserted into the vagina to be in close apposition with the head. As the blade passes through half the circle it will be generally found that it slips into the right side and adapts itself to the cephalic pole.

Locking of Forceps. As soon as the blades have been introduced the forceps should be locked. Considerable difficulty is occasionally experienced in locking the blades but if it is kept in mind that the proper thing to do is to bring the right blade to meet the left blade and never to alter the position of the left blade locking of the blades will be found easier. Another point to remember is

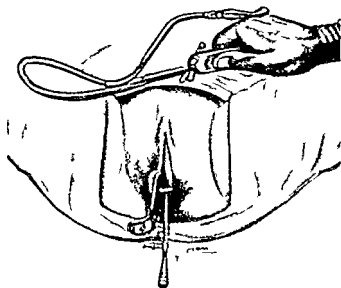


FIG. 18.—Forceps applied on. Method of locking the right or upper blade the left blade is in situ.

that both handles should be pressed well posteriorly against the perineum and again locking will be easy. Occasionally it will be found in occipito posterior positions that even after locking of the blades the handles do not come exactly in apposition with each other throughout the whole length.

After locking the blades and before the fixation screw is applied the axis traction rod of the right blade should be carried posteriorly past the left handle and pressed towards the perineum to meet the axis traction rod of the left blade. The screw is then tightened the axis traction rod locked and finally the traction handle applied. The forceps is now applied and it is desirable at this stage to make a careful vaginal examination to ascertain that the blades have been properly introduced and fitted against the

cephalic pole and that no part of the cervix has by accident been caught within the blades of the forceps. Having satisfied himself about this the obstetrician can now proceed with traction.

Traction. Traction should be applied to the traction handle keeping the traction rod parallel to the shank. The force employed should never be greater than what the flexed forearm can exert. Generally it is advisable to pull during a pain and between these the traction screw which is only lightly fixed is unlocked for a short interval to relieve compression of the head within the blades.

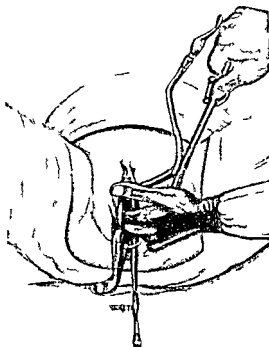


FIG. 179.—Forceps application. Method of introduction of the right or upper blade.

Note the position of the axis traction rod of the upper blade resting on the knuckle of the middle finger.

of the forceps. Usually two or three pulls will bring the head on to the perineum and from this point very little force is required to complete delivery. When the occiput has emerged from under the symphysis it is desirable to remove the blades and to complete the delivery in the manner described in the chapter on the management of normal labour.

In removing the blades care must be taken to see that this follows the law of curves, the right one being carried towards the left side and the left one towards the right side. Some obstetricians prefer to complete the delivery with the forceps *in situ* as they hold that a greater control over the advance of the head can be

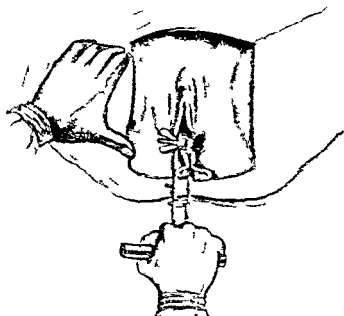


Fig. 180. Illustration of the Method of traction and locking of the forceps

thus obtained. There is little to choose between the two methods of delivery, but it is our experience that the perineum can better be controlled and saved if the forceps is removed just before the greatest diameter of the head passes through the vulvar outlet.

After delivery of the head the shoulders are delivered and the rest of the body slips out.

In every case where forceps is applied all the necessary accessories for the treatment of asphyxia neonatorum should be ready for immediate use.

The management of the third stage of labour and any necessary repairs of the perineum, etc., are dealt with in another chapter.

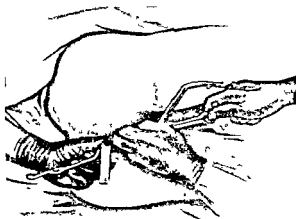


FIG. 182—Forceps application in the left lateral position. Introduction of the upper blade.

High and Low Forceps

It is customary to refer to a forceps operation as high or low, depending upon the level of the head in relation to the pelvic cavity. Four varieties are described:—

- (1) Floating forceps—when the head is above the brim of the pelvis and not engaged
- (2) High forceps—when the head is engaged but the greatest diameter has not passed through the brim
- (3) Mid-forceps—when the greatest diameter has passed through the pelvic brim and the head is in the mid-cavity.
- (4) Low forceps—when greatest diameter of the head has passed the pelvic outlet and is now pressing on the perineum.

Floating forceps is an operation that is never employed now. When the head is not engaged in the brim of the pelvis the forceps

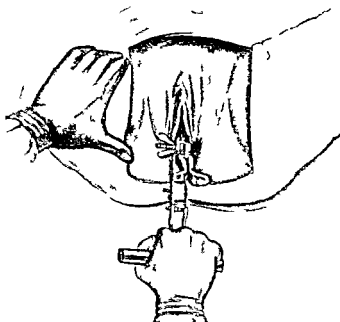


FIG. 180.—Forceps application. Method of traction after locking of the forceps

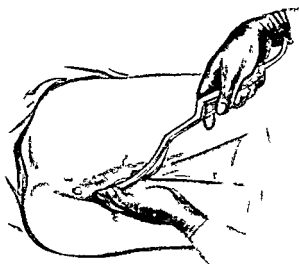


FIG. 181.—Forceps application in the left lateral position. Introduction of the lower blade

thus obtained. There is little to choose between the two methods of delivery but it is our experience that the perineum can better be controlled and saved if the forceps is removed just before the greatest diameter of the head passes through the vulvar outlet.

After delivery of the head the shoulders are delivered and the rest of the body slips out.

In every case where forceps is applied all the necessary accessories for the treatment of asphyxia neonatorum should be ready for immediate use.

The management of the third stage of labour and any necessary repairs of the perineum etc. are dealt with in another chapter.

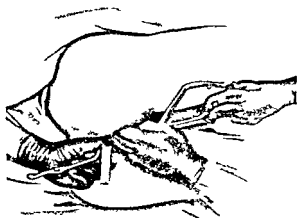


FIG. 18.—Forceps application in the lateral position. Introduction of the upper blade.

High and Low Forceps

It is customary to refer to a forceps operation as high or low depending upon the level of the head in relation to the pelvic cavity. Four varieties are described—

- (1) Floating forceps—when the head is above the brim of the pelvis and not engaged.
- (2) High forceps—when the head is engaged but the greatest diameter has not passed through the brim.
- (3) Mid forceps—when the greatest diameter has passed through the pelvic brim and the head is in the mid cavity.
- (4) Low forceps—when greatest diameter of the head has passed the pelvic outlet and is now pressing on the perineum.

Floating forceps is an operation that is never employed now. When the head is not engaged in the brim of the pelvis the forceps

should never be used. There are no exceptions to the rule. Other methods of delivery must be employed under such circumstances, such as version or lower segment Caesarean section.

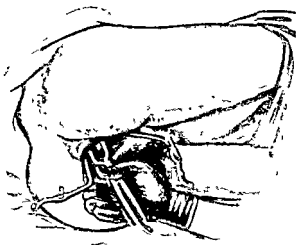


FIG 183 —Forceps application in the left lateral position

Note the position of the axis traction rods after locking the blades of the forceps.

The high forceps operation should be very rarely necessary, and with increasing experience the obstetrician will find that the occasions when he has of necessity to apply the high forceps are

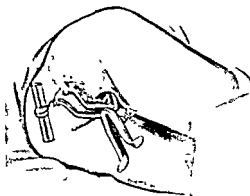


FIG 184 —Axis traction forceps *in situ*

very few indeed. The dangers of high forceps are twofold: the increased pressure exerted upon the foetal head increases the risk of serious intracranial injury, and it is now well realised that many cases of deep asphyxia are due to these causes. Injuries to the maternal parts are also inevitable with the application

of high forceps, and for these reasons we would suggest that other methods of delivery should be seriously considered before resorting to the application of high forceps

The mid forceps and the low forceps are the two operations commonly and justifiably employed

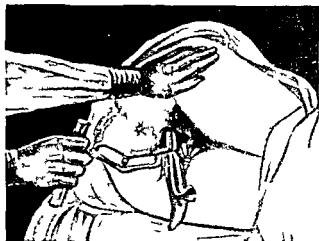


FIG. 18 —Forceps application Traction on with forceps

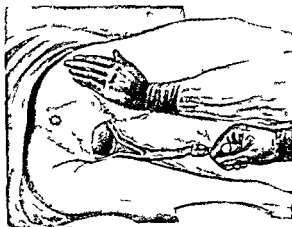


FIG. 18f —Forceps application Delivery of the head at the outlet

Slipping of the Forceps

The forceps may slip when traction is applied The conditions under which this accident occurs are —

(1) Faulty application When the forceps is applied too low on the head, so that it never grasps the head properly, the blades may slip

(2) In certain cases of occipito posterior positions the forceps does not get a good grip of the fetal head if a pelvic application

is used and there is always a tendency to slip unless care be taken to favour rotation of the head before traction is applied

(3) When applied to a hydrocephalic head forceps generally tends to slip. It is obvious that in severe degrees of hydrocephalus the head is too big for the forceps to be applied properly and a grip over a small portion of the cephalic pole only is obtained

(4) Occasionally in cases of rupture of the uterus forceps may tend to slip as the head recedes

(5) When applied to a small head or a macerated foetus the forceps tends to slip

(6) Too powerful a traction or too sudden traction by a jerky movement favours slipping of the forceps

The slipping of the forceps is an unfortunate and dangerous accident. The sudden stretching of the vaginal walls causes severe laceration of the vagina and perineum with hæmorrhage and a certain amount of shock. The presenting part also tends to recede higher up. When there is any tendency for the forceps to slip traction must at once be discontinued and a careful examination of the presenting part and of the pelvis be made to determine as far as possible the particular causes responsible. In some cases it may be found that the forceps method of delivery is unwarranted or unsuitable in such cases other methods of delivery must be considered

Forceps may fail to produce any effect on the progress of the head. A careful examination in such cases has sometimes revealed the fact that the head is still high above the brim and is not really engaged and that a large caput in the cavity has obscured the true level of the head. Under such circumstances and especially in multiparæ with no evidence of disproportion we have frequently performed internal podalic version and extraction provided of course that the conditions were safe for such an operative method of delivery. The results have been gratifying to both the mother and the child. This may seem an obstetric heterodoxy, but practical experience has made us realise the value of version in some of these cases where an unfortunate error of judgment has selected the application of forceps as the method of delivery. It is true that a more thorough examination and a better appreciation of the position of the head with reference to the brim of the pelvis would have prevented the use of forceps and might have suggested the performance of version as a safe method of delivery. But when such difficulties arise we have had little hesitation in performing version provided the necessary conditions are present. We are interested to find that such an authority as DeLee has taken up the same position and we make no apology for quoting him on the subject 'Curiously and in contravention to all

classic obstetric rules of conduct in such cases one may sometimes perform podalic version and extraction even after the head is engaged and after attempts at forceps have failed. Version and forceps application are not complimentary operations rather where version is indicated, forceps is contraindicated. Yet occasionally a case will occur when the circumstances detailed above exist, or a mistake in judgment has been made or the cord prolapsed and one may depart from accepted dogma and secure a happy result by an unorthodox procedure. We have nothing to add to this excellent statement of the case.

Pajot's Manœuvre

Occasionally when the head is fairly low down the ordinary long forceps (Simpson Barnes') may be applied. The forceps is applied in a manner similar to that described for the axis traction

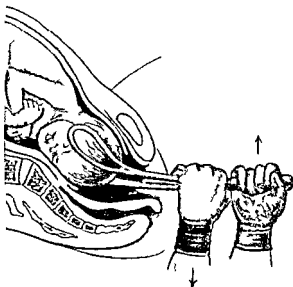


FIG. 187.—Forceps application. Pajot's manœuvre.

forceps except, of course, that there are no axis traction rods to be dealt with. If after application of the forceps there is any difficulty experienced in traction a manœuvre suggested by Pajot can be adopted. The handles are gripped by both hands the left hand gripping it with the palm directed downwards while the right hand grips in the opposite direction, pressure is exerted downwards and backwards by the left hand while the right hand applies traction thereby the head is made to follow the curve of Carus and so delivery is effected.

Forceps in Occipito-Posterior Positions of the Vertex

This subject has been referred to already in the chapter on occipito posterior position of the vertex. It is always advisable to rotate the occiput anteriorly before the application of forceps is made. This manœuvre can be done by introducing the half hand and so rotating the occiput forwards. The occiput is then steadied and the forceps applied and delivery completed. Sometimes however this manœuvre does not succeed for example in the case first seen late in labour when the head has become jammed in the pelvis and a large caput has developed. The question then arises how best to effect delivery with forceps. It has been already stated that in a large number of cases where the occiput has rotated slightly or even where it has failed to rotate light traction on the forceps initiates rotation which may then be completed by the forceps. The method of application of forceps in these cases is of some importance. In an occipito posterior position the cephalic method is preferable as the chances of the instrument slipping are much less. Whether the pelvic method or the cephalic method is adopted in those cases where rotation has not been completed spontaneously and the forceps is used to rotate the forceps comes to lie anteroposteriorly or nearly so with reference to the maternal pelvis or even back to front. It is necessary under these circumstances before delivery is completed to remove the blades and reapply them so that the pelvic curve of the forceps will again fit the curve of Carus.

An alternative manœuvre which is sometimes adopted but which we do not favour is to apply the blades in the reverse direction so that the pelvic curve is directed posteriorly and then to rotate. The forceps after complete rotation will be in the natural position with the concavity of the pelvic curve directed anteriorly. We believe that the best method of rotation is to take advantage of the natural tendency for the forceps to rotate after application and so we cannot recommend this method of application.

In some cases if traction is applied without carefully noting the tendency for rotation the head may slip out suddenly and be born as a persistent occipito posterior with the face towards the pubis. If this happens there is a greater tendency for severe lacerations of the perineum to occur and the foetal head also is more susceptible to damage.

Forceps in Face Presentations

Where the chin is anterior spontaneous delivery is likely to occur provided there is no disproportion. Occasionally however for the same reasons which delay an occipito anterior position a mento anterior case may require help with forceps. Some care

and delicacy is necessary in the introduction of the blades as the soft parts of the fetal face are liable to be damaged. The place of forceps in mento posterior cases has been debated at length. Every effort should be made to favour anterior rotation of the chin before application of the forceps but cases have occurred in one's experience where this has failed to take place. Under such circumstances forceps may be applied and with light traction a tendency to rotation may be noted. This must be encouraged so as to bring the chin anteriorly. The forceps must then be removed and reapplied before delivery is completed just as in forceps rotation of occipito posterior positions of the vertex. The alternative craniotomy which is the last resort should not be undertaken till the forward rotation of the chin has been tried. Rotation in mento posterior cases does mean a greater risk of injury to the soft parts of the face but such injuries are not serious and generally do not lead to any permanent damage.

Forceps in Brow Presentations

Forceps should not be used in a brow presentation until the brow has been converted into a face or a vertex presentation. In many cases it is wiser to convert the brow into a breech by internal version where this is possible. In some cases however it may be found impossible to convert the brow into a more favourable presentation and then the question arises whether the forceps should ever be used. As the forceps is generally applied before perforation we apply forceps and attempt traction giving two or three fair pulls. It is surprising how where the head is not too big even when it presents as a brow it may be delivered. If this does not succeed at this late stage of labour perforation may be done and delivery completed by extraction with forceps.

Forceps to the After-coming Head

In considering the management of cases of breech presentation we have referred to the use of forceps for delivery of the after coming head. The forceps may be applied to the after coming head in one of two ways —

(1) The body of the child may be carried upwards towards the mother's abdomen and the blades of the forceps introduced below the trunk. The operator then applies traction on the forceps.

(2) Occasionally the forceps may have to be applied in front of the trunk in those cases where the occiput is posterior.

In all cases where forceps is applied to the after coming head great care is required in its application and the subsequent extraction of the head as otherwise considerable damage to maternal tissues may ensue. It is not very often that one is called upon to apply

forceps to the after-coming head, as the manœuvres described under breech presentations for the delivery of the after-coming head will, with experience, seldom fail.

Forceps to the Decapitated Head

In some cases forceps may have to be applied to deliver the decapitated head. Usually the decapitated head can be easily delivered by fundal pressure, and a finger introduced into the mouth in a manner similar to delivery of the after-coming head of a breech presentation. When this fails it is advisable to grasp the head with a volsellum, steady it by fundal pressure and apply forceps. If the head cannot be delivered with easy traction there should be no hesitation in perforating the vault of the skull and then delivering the head. If there is still difficulty a cranioclast must be applied.

Prognosis in Forceps Application

Any interference with nature in the delivery of the child, such as a forceps application, must necessarily add to the risks of the mother and the fetus. If applied with caution and for proper indications, with all the conditions necessary for the safe application of forceps present, these risks will be reduced to a minimum; but if the forceps is used at a stage when it is not safe, or under circumstances when its use is contraindicated, the gravest risks may be incurred both by the mother and the child. As a rule, the higher the head in the pelvis the greater is the risk for both mother and fetus. The outlook also varies according to the indication for which the forceps is applied. For example, it is greater when used in cases of occipito-posterior position or contracted pelvis than for delay due to a rigid perineum.

The slipping of the forceps is a serious accident.

The risks to the mother in the application of the forceps are —

(1) Injury to the soft parts, such as tears of the vagina, cervix and even lower uterine segment; lacerations of the urethra and perineum with possible involvement of the rectum. Fistulous communication with the bladder or the rectum may result.

(2) Hæmorrhage. This may be the result of lacerations. Occasionally if the forceps is used where the uterus is not contracting and has not regained its tonus, delivery may be followed by severe atonic postpartum hæmorrhage.

(3) Infection. This is one of the gravest dangers and the chances of infection are increased not merely by the introduction of the forceps in a careless manner, but by the lacerations and the hæmorrhage which render the mother more susceptible.

These are the immediate risks, but it must be realised that

there are remote effects which must be taken into consideration when assessing the prognosis for the mother. The remote risks are due to the lacerations of the vagina and perineum which produce a relaxation of the pelvic floor and favour the development of cystocele, rectocele and uterine prolapse. Occasionally there may be no tear of the skin surface but the separation and division particularly of the levatores ani may lead to a weakening of the pelvic floor. Tears of the cervix and the lower uterine segment may lead to chronic cervicitis, atresia or chronic pelvic inflammatory trouble. Erosions of the cervix at a later date predispose to malignant changes. Infections of the urinary tract may persist and lead to diverse complications at a later stage.

A complication that may occasionally be noted is subluxation of the symphysis pubis which weakens the pelvic girdle. In fact more damage is done to the mother after the forceps application than after any other form of delivery and the large number of women who seek assistance some months or even years after such a delivery at the gynaecological outpatient department demonstrates the amount of damage that may result to the mother from injudicious use of the instrument.

Dangers to the Child. These may be compression of the brain, intracranial hæmorrhage, tears of the tentorium, fracture of the skull, injury to the eyeball even leading to avulsion of the eye, retinal hæmorrhages, corneal opacities, facial paralysis, pericranial hæmatoma, lacerations of the scalp and Erb's paralysis.

It should not, however, be thought that these various injuries to the mother or the child occur frequently or are inevitable. The emphasis is to be laid rather on the proper use of the instrument and the prevention of its abuse.

Kielland's Forceps

In 1915 Kielland of Norway introduced a new forceps which has been widely used in Germany and Scandinavia. The advantages claimed for this forceps are —

- (1) The head is always grasped in the biparietal diameter and hence in the subsequent traction there will be no slipping of the forceps. The application is always cephalic.
- (2) Forceps rotation of the head is safe as the blades fit the head closely and there is no possibility of slipping.
- (3) Such pressure as is inevitable in the application of this forceps is made on that part of the foetal head which can best resist it so that the cheeks, the underlying bones, the orbits, chin, etc. are not affected and the inevitable trauma to the soft parts, to nerves and brain does not therefore result.

- (4) Another advantage claimed is that the presenting part is not displaced by the introduction of the blades and that as less forcible traction is necessary for the delivery, the risk of maternal injuries is minimised

The forceps itself consists of two blades which are articulated by a slot on one of the blades into which the other blade slides. The absence of any locking arrangement, as in the ordinary forceps, is significant and the method of articulation is the most characteristic feature of this instrument, allowing one blade to slide longitudinally along the other. The advantage of this is that the head may be

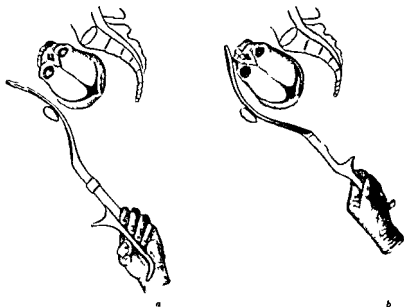


FIG. 188 —Kielland's forceps showing (a) the introduction of the anterior blade (b) position of the blade after rotation

grasped by the blades lying at different vertical levels. There is a very small pelvic curve so that the blades resemble the old model of straight forceps. The cephalic curve is almost similar to that in the ordinary Simpson Barnes' forceps.

The method of application of Kielland's forceps is as follows —

The patient is placed preferably in the dorsal position, with the buttocks well over the edge of the table, and after the usual anti-septic precautions have been taken and the parts protected with sterile sheets, the bladder is emptied by passage of a sterile catheter and the patient anaesthetised. The position of the head is well defined.

The anterior blade is now taken in the right hand and two fingers of the left hand inserted into the vagina, so as to pass

beyond the anterior lip of the cervix and underneath the symphysis pubis. The blade is introduced horizontally the fingers guiding it into position with the concavity of the foetal curve facing the pubis.

The blade is passed well into the vagina until the tip of the blade touches the skull and then onwards well inside the uterus but with no force until the middle round part of the skull lies under or behind the symphysis pubis. The vaginal fingers are now withdrawn and the anterior blade is rotated on its long axis.

The rotation is done through 180° towards the side on which the button is situated on the forceps blade. The anterior blade is thus applied automatically with its tip over the malar bone of the foetal head. The blade is left *in situ* without any artificial support.

The second or posterior blade is now guided by two fingers passed into the vagina between the posterior cervical lip and the head. The blade is gently passed to the side of or in front of the sacral promontory. The blades are now locked and as the lock is so constructed that it will be effective even if one blade is higher than the other little difficulty will be found in this procedure. The forceps is now in the antero-posterior diameter of the pelvis and has grasped the head symmetrically. Traction is applied intermittently in the direction of the handles of the forceps until the head reaches the middle of the pelvis or lower down.

When the head has been brought well down into the pelvic cavity it can be rotated by the forceps so that the occiput comes to the front. In some cases the rotation is spontaneous and as the outlet is approached extraction through the outlet should be slow to avoid tears of the perineum.

The *contraindications* for the use of Kielland's forceps are stated to be —

- (1) When the head is floating above the brim
- (2) In cases of contracted pelvis where the head is still above the inlet
- (3) A large head causing gross disproportion or a hydrocephalic head
- (4) When the uterus is tonically contracted and a retraction ring is present

Although the use of Kielland's forceps has been very strongly advocated by some obstetricians we have been unable to appreciate the many advantages claimed for this instrument. In our opinion it is not in any degree safer than the ordinary axis traction forceps and if one is accustomed to apply axis traction forceps or the ordinary Simpson-Barnes forceps properly many of the so-called disadvantages which are supposed to be overcome by Kielland's forceps will not arise. Slipping of the forceps is generally due to

an incorrect appreciation of the position of the head and the necessity to favour rotation before using traction. Neither the Kielland's forceps nor the ordinary Simpson Barnes' forceps should be used when the head is still above the brim of the pelvis. With care in the method of application and traction graduated there should be little or no tendency for any damage to the foetal head or to the maternal parts. The ordinary Simpson Barnes' or axis traction forceps can be applied with reference to the foetal head in the same manner in which the Kielland's forceps is supposed to grasp it. We fail to see why the head should be displaced by the introduction of the blades of the axis traction forceps if care is taken to see that in the guiding of the blades only two fingers are gently introduced into the vagina. As far as traction with the ordinary forceps is concerned we have already stated that only the minimum force necessary should be used and maternal injuries should not be any greater than with Kielland's forceps.

CHAPTER XLVII

VERSION

By this operation the presentation of the foetus is changed so that either the cephalic or the podalic pole is substituted for the existing presentation.

Version is one of the oldest of obstetric operations and was the only method of delivery available in cases of difficulty to obtain a live child before any of the obstetric instruments particularly the forceps were invented.

Classification There are two methods of classification adopted the first, according to the part of the foetus which is brought down to the pelvic inlet, and the second, according to the manœuvre by which version is performed.

Depending upon the part that is made to present at the pelvic inlet version may be classified as

1 Cephalic version and 2 Podalic version

Depending upon the manœuvre that is adopted there are three varieties of version namely —

- (1) External version
- (2) Bipolar version—or combined external and internal version, or Braxton Hicks' version
- (3) Internal version

These different forms will be considered *serialim*

Cephalic Version

The object of this manipulation is to substitute the vertex for a less favourable presentation. Thus in cases of breech or shoulder presentations the cephalic pole may be brought to present at the pelvic inlet.

Theoretically cephalic version is indicated whenever an abnormal presentation occurs as with the cephalic pole presenting the prognosis for the foetus is better provided the head can pass through the pelvis either spontaneously or with legitimate aid by forceps.

Cephalic version is however not indicated in cases of placenta prævia presentation of the cord or slight degrees of flattened pelvis.

It can be done either by external manipulation or by combined internal and external manipulation.

Podalic Version

Here the podalic pole or breech is substituted for the presenting part.

Podalic version is particularly indicated

(1) In cases of transverse or oblique lie and for two reasons we prefer this to cephalic version

(a) Where a transverse or oblique lie is converted into a breech presentation either in the last few days of pregnancy or early in labour the change in the position once again to an oblique presentation should it occur is not so unfavourable as the breech will still be easier to reach during the course of labour so that it may be converted once more into a podalic presentation.

(b) In the majority of cases of transverse lie when the patient is in labour and the membranes have already ruptured podalic version is the only method available for correction of presentation.

(c) In cases of placenta prævia as a method of treatment for the arrest of hæmorrhage and to complete labour.

(3) In cases of prolapse of the cord either for effecting immediate delivery when the head is still freely movable above the brim of the pelvis and the cervix is fully dilated or where this cannot be done with a view to minimise the chances of compression of the cord by the presenting part.

(4) In some cases of cephalic presentation with deflexion or complete extension such as face brow gluteal presentations or occasionally occipito posterior positions.

(5) Where the head does not engage at the brim, although the patient has been in labour for some hours and there is no disproportion particularly in multiparae

(6) In cases of compound presentation where the head is still above the brim

(7) In minor degrees of flat pelvis, a podalic version may offer a safer method of delivery for the foetus than a forceps application

DIFFERENT METHODS OF PERFORMING VERSION

As has already been stated, three methods of performing version are available

External Version When external version is performed, the position of the foetus can be changed either into a cephalic or a podalic presentation. The indications for such conversion have already been stated

Certain conditions are essential for the performance of external version. These are —

- (1) The membranes should be intact and there must be sufficient liquor amni to permit of the easy movement of the foetus *in utero*
- (2) The uterus must be fairly lax
- (3) The abdominal muscles must be lax and sufficiently thin to allow of the external manipulations being transmitted to the foetus
- (4) The presenting part should not have entered the pelvic brim

When should external version be performed? It is generally held that when any abnormal presentation is recognised by abdominal palpation at an antenatal clinic the obstetrician should correct the presentation into a more favourable one. This is always done by the external method of version. In the majority of cases correction at a period of pregnancy earlier than the thirty-sixth week is unnecessary, as the foetus tends itself to assume a more favourable presentation in the later weeks of pregnancy. It may, however, be held that the woman may go into labour prematurely, in which case the abnormal presentation will undoubtedly increase the foetal risks. But here the foetus is small and the malpresentation more easy to deal with. While therefore, the necessity of converting every abnormal presentation into a more favourable one when first recognised may be accepted in theory emphasis should be laid on the fact that not infrequently these positions tend to change spontaneously. Again, the patient should always be warned that where version has been effected it should not be considered as a final correction of the malpresentation. Under such circumstances the patient should be cautioned about the possibilities of a mal

presentation recurring and told that the safest course for her is to seek obstetric aid as soon as labour begins. Frequent visits to the antenatal clinic at intervals of a week help to determine whether the presentation has again changed.

When a patient is in labour external version is possible only in the early stages —

- (a) Before the presenting part has engaged in the pelvic brim
- (b) Before the membranes have ruptured and
- (c) Before the uterus has begun to contract strongly

There are certain dangers and difficulties associated with external version which though infrequent must be borne in mind —

(1) One of the difficulties is that in the process of manipulation some part of the foetus may be caught against the uterine wall and there may be a tendency for premature separation of the placenta to occur.

(2) In cases of extended breech it is not easy to change the presentation into a cephalic presentation as the extended legs act as splints and prevent dorsiflexion of the foetus. Gentle manipulations are necessary and the foetal heart should always be watched as also the general condition of the patient. It is therefore inadvisable to give an anaesthetic to the patient before performing external version. Anaesthesia may be rarely indicated in those cases where the patient is extremely nervous and holds the abdominal muscles rigid or in the first stage of labour where the uterus is irritable and manipulations provoke a contraction. Even under such circumstances light anaesthesia is to be administered and the condition of the patient and of the foetus carefully watched.

Technique The manipulation consists in

(1) Carefully locating by abdominal palpation the different parts of the foetus particularly the breech and the head and the position of the back of the foetus.

(2) One hand is placed over the breech the other over the cephalic pole and by alternate light pushing manœuvres the pole which is to present at the pelvic brim is brought down while the opposite pole is gradually pushed towards the fundus.

Time should be taken in these manipulations and no attempt should be made to change the position by any jerky or sudden movement as the uterine ovoid must gradually accustom itself to the changing foetal ovoid.

(3) After the version has been completed the foetus should once more be carefully palpated to ascertain definitely that the desired presentation has been obtained and to define its position.

An abdominal binder is applied at this stage to steady the foetal ovoid and so allow the presenting part to become engaged in the pelvic brim. If the woman is already in labour the membranes

should be ruptured so that the head may fix and a tight abdominal binder is applied. Where external podalic version has been carried out as in cases of placenta previa a foot may be brought down through the cervix and left in the vagina after rupturing the membranes and the further delivery left to natural efforts.

It is desirable that the woman should be kept in bed after external version during the first stage of labour.

Bipolar or Combined Version This is also called Braxton Hicks method as he was largely responsible for evolving the correct technique and popularising this method. By this manoeuvre either

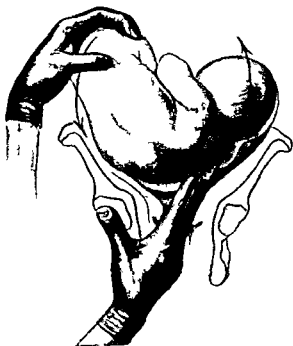


FIG. 189 —Bipolar or combined version (Schematic representation.)

the cephalic or podalic pole of the fœtus may be substituted for the presenting part. The indications have already been discussed.

This method of version is adopted when the woman is already in labour. The following conditions are necessary for its successful performance —

- (1) The os should be sufficiently dilated to admit at least two fingers.
- (2) The membranes should either be entire or recently ruptured with a sufficiency of liquor amnii to allow of free movement of the fœtus within the uterus.
- (3) The uterine muscle must be relaxed.
- (4) The abdominal wall should be lax and not unduly laden with fat.

Technique The patient is anesthetised and placed in the lithotomy position. Strict antiseptic precautions should be taken and the vulva prepared as for any obstetric operation. The position of the foetal parts must be carefully mapped out by abdominal palpation and the bladder emptied. The operator then introduces one gloved hand into the vagina and two fingers of this hand into the cervical canal so as to reach the presenting part. The other

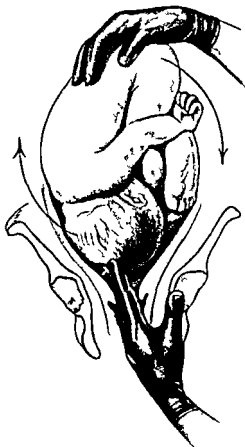


FIG. 190.—Bipolar or combined version. I stage

hand is placed on the abdominal wall and by pushing the presenting part away from the pelvic brim with the fingers in the cervical canal and simultaneously gently pushing the opposite pole towards the pelvis the position of the foetus is changed by gradual manipulations so that the particular pole which is to present is brought to the pelvic brim. After the position has been changed the membranes may be ruptured, a tight abdominal binder applied and the patient kept in bed. If the presentation has been changed into a podalic one a foot may be brought down after rupture of the membranes.

if necessary and left in the vagina so that further delivery may take place by natural efforts

Internal Version Internal version is always podalic. The smooth, round head cannot be grasped satisfactorily by the hand in the uterus so as to be brought down to and kept in position at the pelvic brim. While, therefore external version and bipolar version may be either cephalic or podalic in type it must be clearly realised that internal version will permit of change of presentation to a breech only.

Internal podalic version may be adopted in several circumstances and the indications will increase with the experience of the obstetrician in the performance of internal podalic version and extraction. While we do not agree with Potter of Buffalo that the routine method of delivery in all cases should be version and extraction we feel that internal podalic version as a safe method of delivery has a place in the treatment of many cases where the obstetrician at present adopts more radical methods. Few are prepared to support Potter, for it must be realised that in the great majority of cases nature's method is the best method of delivery, and any operative technique which radically interferes with the immense potentialities of nature in regard to a safe delivery both for the mother and the child should, in our opinion be discouraged. We however feel that with experience and a correct appreciation of the technique involved in version and extraction the obstetrician will find it a useful method of operative delivery in a greater proportion of cases where the alternatives are a Cæsarean section, high forceps or a perforation.

Indications

- (1) Minor degrees of contracted pelvis of the flat variety
- (2) Transverse and oblique lies
- (3) Prolapse of the cord
- (4) Brow presentation face or glabellar presentations—with the chin posterior certain cases of occipito posterior positions and certain of the deflexion attitudes of the fœtus where the cephalic pole does not enter the brim of the pelvis
- (5) In some varieties of compound presentations
- (6) In selected cases of placenta prævia in certain cases of accidental hæmorrhage,
- (7) In cases where a rapid method of delivery through the natural passages is indicated, provided the conditions necessary to perform internal podalic version safely are present

Conditions necessary for the safe performance of internal podalic version —

- (1) The cervix must be sufficiently dilated so that the whole hand can be introduced into the uterine cavity

(2) The condition of the uterus should permit of internal podalic version being performed. This is by far the most important condition that must be satisfied before the operation is attempted.

It is obvious that any intrauterine manipulation must be a source of grave risk once the uterus has passed on to the stage of tonic contraction, the uterine muscle of the lower uterine segment is considerably thinned out while the upper uterine segment is contracted and thickened. The lower edge of the thickened upper segment is known as a retraction ring or Bandl's ring. Injudicious attempts to change the position of the foetal ovoid once Bandl's ring is demonstrable clinically, may cause such a strain on the thinned out lower uterine segment that it gives way. Internal podalic version is therefore contraindicated under such circumstances, but occasionally, if the foetus is still alive and stands a chance of surviving delivery, if relaxation of the uterus to the maximum extent possible can be obtained by deep chloroform anaesthesia version may be attempted by an experienced obstetrician. If such an experienced operator is not available one should not hesitate to effect delivery by one of the other methods which involve destructive operations of the foetus rather than risk both mother and child.

Where however the uterus is comparatively lax internal version is by no means difficult provided the special precautions described in the technique are followed after careful selection of the case.

(3) The patient should be anaesthetised. It is preferable that a deep degree of anaesthesia surgical anaesthesia should be obtained in these cases. In fact if internal podalic version is undertaken under circumstances where the uterus is already contracting strongly and Bandl's ring is present a very deep degree of anaesthesia is necessary to allow of the maximum relaxation of both the abdominal and uterine musculature. In some cases it may be necessary to administer a narcotic like morphia (quarter to half a grain) before anaesthesia with chloroform is given.

(4) The presenting part should not be fixed in the brim of the pelvis—at any rate it should be capable of being easily dislodged to allow of the hand being introduced into the uterine cavity so that the subsequent manipulations can be performed.

(5) There should be no severe degree of contraction of the pelvis to prevent the easy introduction of the hand as this would involve possibilities of the uterine muscle being lacerated apart from the subsequent difficulties in the delivery of the foetus especially the aftercoming head.

Technique The operation should be undertaken after carefully weighing all the factors involved and satisfying oneself that the conditions described above are present. The patient is prepared as for a major obstetric operation the vulvar area is shaved and

cleaned and the bladder emptied. After being anaesthetised, she is then brought to the edge of the bed and made to lie in the dorsal position. Great care should be taken in the antiseptic precautions, and the operative field protected with sterilised towels and sheets. It is advisable that the patient should be brought well down to the edge of the bed, so that a portion of the buttocks may be free. We prefer two assistants supporting the legs, one on either side, so that the thighs do not press against the abdominal wall. The abdominal wall itself is covered by a sterilised towel thrown over it. When the patient is well under chloroform, the operator separates the labia with one hand and passes the other gloved hand, formed into an

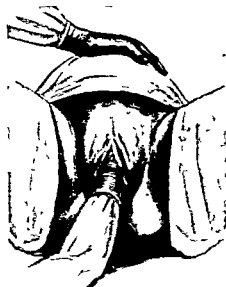


FIG 191 —Internal podalic version. One hand in the uterus, the other steadying the fundus.

obstetric cone, gradually into the vaginal cavity and then through the cervical canal into the uterus. The other hand is now placed on the sterilised towel over the abdominal wall to manipulate the foetal parts in the later stages of the operation. The hand in the uterus is guided past the presenting part, till it reaches a foetal knee. Slight pressure on the posterior aspect of the knee causes flexion of the leg, and the index finger is then hooked round the flexed knee and gentle traction applied on the knee to bring the leg into the lower uterine segment. It is important that the value of this manipulation should be appreciated, particularly when the uterus is approaching tonic contraction and there is not a sufficiency of liquor amnii in the uterus as, for example, in a case of neglected shoulder presentation. In spite of the deep anaesthesia, the uterus will not relax to permit of the obstetrician's hand being stretched to grasp the foot of the

the extraction of the breech be borne in mind it will easily be seen that with a slight rotatory movement during the further extraction of the body of the foetus this difficulty is not likely to arise even if the posterior limb is brought down first.

In the process of internal version done under conditions where the uterus is really tonically contracted considerable difficulty is experienced in reaching a lower limb and it may be an impossible task to get at the anterior limb whereas the posterior one is within reach. For this reason we do not lay much emphasis on the particular limb that should be brought down and we feel that most obstetricians who have had experience of internal podalic version under these difficult conditions of strong uterine activity will agree with us that one is thankful to get hold of any foot and bring it down. It is of value however to emphasise the fact that whichever foot is brought down it is necessary in the subsequent extraction of the foetus to see that the leg is so rotated as to bring the back anteriorly.

When one foot has been brought out we do not think there is any necessity to reintroduce the hand and attempt to bring down the other foot also. We would go further and say that it is a great mistake to waste precious time and expose the woman to additional risks of sepsis and possibilities of hæmorrhage due to further delay. Nor do we think it is of the least use trying to get hold of both feet simultaneously and so bring them down as this is bound to fail in the really difficult cases of podalic version.

The subsequent stages of delivery of the foetus have been referred to in the chapter on breech presentation. Once the position of the foetus has been altered the question whether immediate delivery is indicated or not must be decided by the condition of the foetus and of the mother. But in all cases where immediate delivery is indicated it is of importance to give sufficient time in the subsequent manipulations of extraction to allow the uterine ovoid to adjust itself to the altering position of the foetal ovoid. It may also be mentioned here that this amount of manipulation of the foetus has a definitely adverse effect upon the foetal heart so that some little time should be given for the foetus to recover from the shock of the manipulation before extraction is attempted.

Prognosis In properly selected cases the prognosis should be good so far as the mother is concerned as little or no damage need be done to the maternal soft parts. There is however the increased risks of sepsis following an intrauterine manipulation as infection may be carried into the uterus from the lower genital tract. In cases where the operation is undertaken at a late stage of labour there is a risk of rupture of the uterus but as we have already stated the operation under these circumstances should only be undertaken by an expert.

It is desirable and wise to acquaint the relatives, and very occasionally the mother, of the circumstances under which such an operation is necessitated, and obtain their consent before resorting to it

Included under the terms "embryotomy" or "embryulcia" are the following destructive operations that may be performed on the child —

(1) Craniotomy combines three steps (a) Perforation, wherein the foetal skull is opened into by a perforator and the cranial contents evacuated (b) Cranioclasm or cephalotripsy, whereby the head is comminuted and its size reduced (c) Extraction of the child

(2) Decapitation In this operation the head is separated from the trunk by cutting through the neck with a special decapitating hook or a knife or a pair of scissors

(3) Cleidotomy consists in cutting through the clavicles, so as to reduce the bisacromial diameter when the child has too broad shoulders

(4) Evisceration The removal of the viscera from the abdominal or thoracic cavity after opening the abdominal or the thoracic wall

(5) Spondylotomy is the term applied to cutting through of the spinal column and the division of the trunk of the foetus into two halves

Craniotomy

Indications —

(a) *When the child is dead* —

- 1 When the head is hydrocephalic
- 2 Where disproportion exists, and delivery is impeded owing to a contracted pelvis or a large child, provided reduction in the size of the head will permit of delivery
- 3 For the delivery of the after coming head
- 4 In occipito posterior or mento posterior cases, when other methods of vaginal delivery have failed or are inadvisable
- 5 In some cases of locked twins it is necessary to perforate one of the twins with a view to effect the delivery of the second twin

(b) *When the child is living* (The precautions to be taken before resorting to craniotomy in such circumstances have been detailed in the introduction to this chapter)

1 Hydrocephalus is an indication for craniotomy. Cæsarean section would result in the delivery of a child with little prospect of survival, and, if it did, the certainty of mental deficiency

2 In cases of prolonged labour, when the head is jammed in the pelvis and the foetus shows evidence of distress, or there is

possible infection of the genital tract. The alternative under such circumstances is a Cæsarean hysterectomy but it must be clearly realised that this operation results in the delivery of a very much damaged child born alive perhaps but with little chance of survival. Even if the uterus is removed the chances of peritonitis are considerable. Again the removal of the uterus after the section results in permanent sterility and is not to be lightly undertaken merely with a view to gratify one's pride in not resorting to craniotomy. For similar reasons craniotomy withheld in cases of occipito posterior or mento posterior positions jammed in the pelvis in favour of a difficult forceps delivery which damages the maternal tissues irretrievably has very little to commend itself.

3 Craniotomy may also be the only possible method in certain cases of pelvic disproportion when institutional facilities are not available for the major operative methods of delivery. We do not consider it justifiable that the tremendous responsibility incidental to other methods of delivery should under such circumstances be lightly undertaken. It is preferable to face a craniotomy with certain death of the foetus rather than increase risk to the mother and probably still lose the child even after Cæsarean section.

Conditions. Craniotomy should be undertaken only when it is possible to deliver the mutilated foetus through the natural passages. In the extreme degrees of contracted pelvis it is not justifiable not even after basilectomy and cephalotripsy. Such prolonged operations are infinitely more risky from the point of view of the mother than a Cæsarean hysterectomy and we are convinced that the sooner the obstetrician gives up such destructive operations as basilectomy and cephalotripsy the better. We have had no occasion to perform such operations for a very long period now.

Before craniotomy is undertaken the cervix must be well dilated or easily dilatable.

Technique of the Operation. There are three stages in the operation of Craniotomy (1) Perforation (2) Cranioclasm or cephalotripsy (3) Extraction. The preparations are as thorough as for delivery with forceps. In fact great care is needed in these cases as the large majority are brought to the obstetrician late in labour when the possibilities of sepsis are by no means small.

Perforation. The patient is given a general anæsthetic and put in the lithotomy position. After the preliminary toilette of the field of operation has been completed and the bladder has been emptied the head is perforated. The first step in the stage of perforation is to fix the presenting part namely the head. This can be done by one of two methods (a) By an assistant applying suprapubic pressure or (b) by the application of forceps to the head. We prefer the latter method as it steadies the head very efficiently and after perforation in the majority of cases allows the head to be

delivered with ease by traction on the forceps. If this precaution of fixing the head is not taken the chances are that the perforator may slip as the head recedes under its pressure and thus cause serious damage to the maternal soft parts in some cases perforating through the anterior vaginal wall and the bladder.

The head having thus been fixed by the application of forceps the perforator is grasped in the right hand two fingers of the left hand are passed into the vagina to locate the seat of perforation.

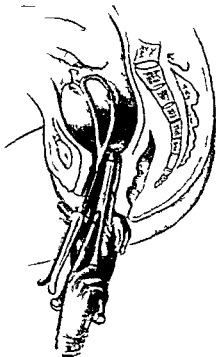


FIG 193.—Cranotomy. The perforator has been introduced into the vagina guided by the fingers and steadied against the head which is fixed in position by the preliminary application of forceps.

the perforator guided along the palmar aspect of the fingers and applied to the head and the point fixed against the most prominent bony surface of the cranium it is then pushed through the skull by a slight drilling movement and as soon as the blades have pierced the skull they are opened so as to cause a longitudinal slit. The perforator is then closed turned at right angles and reopened so that a crucial incision is made in the skull bone. Occasionally when it is desired to make a large sized opening it may be necessary to turn the perforator through the two oblique diameters of the opening and allow the blades to be opened in the same manner as has just been described. When the hole has been made in the bony skull

the perforator is passed into the brain substance which is then stirred up. Once the brain has been broken up the instrument is passed into the floor of the cranial cavity and the medulla oblongata and the commencement of the spinal cord destroyed.

A point of some importance is the situation of the opening made in the skull. It is not desirable to perforate through a fontanelle or a suture as when the perforator is removed and an attempt is made to deliver the head the skull bones tend to overlap and thus close the opening so preventing the escape of brain substance. We therefore strongly advocate perforation through bone and not membrane. The exact site of the perforation depends upon the presentation. In cases of vertex it is through a parietal bone near

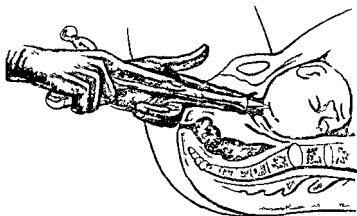


FIG. 194. Craniotomy. Longitudinal slit made by the perforator.

one or other of the fontanelles. In cases of brow presentations it is through the frontal bones; in a case of face presentation through the orbit or the mouth; and in an after-coming head it is through the occipital bone near the posterior fontanelle.

After perforation has been effected it is not necessary to remove the perforator. The forceps having been applied as already stated the perforator is left *in situ* and traction is applied. The traction should be gently applied as otherwise the chances are the forceps may slip. This is particularly so in occipito-posterior and mento-posterior positions. If occasionally there is resistance still felt in the progress of the head the perforator may be used to stir up the brain contents a little more to allow the brain matter to be squeezed out of the perforated hole. We have never felt the necessity for washing out the brain material—a procedure suggested by some obstetricians. If the perforator thoroughly stirs up the whole of the brain matter it converts it into such a fluid pulp that it escapes

with little difficulty as the skull bones collapse by the pressure exerted on them by the pelvic walls.

It is of the greatest importance to see that the perforator is sharp. With a blunt-edged perforator the dangers of the instrument slipping are much greater especially as a much greater amount of force is required.

In some types of perforators the blades have a slight curve. In passing such perforators along the fingers it is necessary to see that the convex surface is in apposition with the palmar aspect so that the point of the perforator may not injure the operator's hand or the pelvic wall. When the Simpson's perforator is introduced the operator should familiarise himself with the method of locking and unlocking. Of the several perforators in the market we prefer Oldham's or Simpson's model. The scissor type of perforator does not allow of sufficient force being exerted in the opening of the blades so as to cut through the skull bones and from this point of view it is not as satisfactory as the other patterns that we have just mentioned.

Prognosis. In a destructive operation such as this the prognosis depends upon several factors not the least important of which are the circumstances under which the operation is necessitated and the general condition of the mother. The greater the previous amount of handling the greater is the risk of sepsis and the graver is the prognosis. If done with care and in cases where no contra-indications exist such as extreme degrees of contracted pelvis the operation may not be attended with any increased risks so far as the mother is concerned. It is not justifiable to attribute to craniotomy the risks incidental to prolonged labour and infection of the case prior to resorting to the operation. The gross mortality in such cases is decidedly high and the morbidity is even higher but it must be realised that in the majority of cases the causes are extrinsic rather than intrinsic so far as the particular operation is concerned.

CRANIOCLASM

The alternative method to forceps for extracting the head after perforation is the application of the cranioclasp. This instrument consists of a solid blade which is introduced through the perforation hole in the skull until the tip of it impinges against the base of the skull while the fenestrated blade is applied in the same manner as one of the blades of the forceps to the outer surface of the skull. The screw is tightened after the application of the two blades so that the vault of the skull is compressed and a firm hold is obtained for the extraction of the foetal head.

The advantages of the cranioclasp therefore are —

- (1) That it secures a very firm hold of the foetal head and
- (2) That it crushes a portion of the skull and thus diminishes the

size of the head still further than has been done by the preliminary perforation

In cases therefore of the more severe types of contracted pelvis it may be necessary to use the cranioclast for the extraction of the head. Occasionally in such cases the pelvis may be so contracted that a still greater amount of crushing of the head is necessary before it can be extracted. Many instruments have been devised to do this but the three most commonly used are —

- (1) The cephalotribe
- (2) Basilyst with tractor
- (3) Combined cranioclast and cephalotribe

CEPHALOTRIPSY

There are many varieties of cephalotribe one of the best being Braxton Hicks' model. It consists of two heavy fenestrated blades which are applied to the skull on either side after perforation. By means of a screw at the end of the handles the blades are approximated and thus the vault of the skull completely crushed. It undoubtedly diminishes the size of the vault of the skull but one of its chief disadvantages is that the head frequently slips from between the blades.

BASILECTOMY

The destruction of the vault of the skull alone may not be sufficient to permit delivery of the head. Difficulty in these cases is due to the base of the skull which is a hard bony structure with a number of bones dovetailed into one another and united by bony union. An instrument called a basilyst has been devised to destroy the base of the skull. In the Simpson's basilyst there is a tractor also so that after the operation of basilectomy is done the tractor may be used to extract the crushed head.

Simpson's basilyst consists of a strong metallic drill which can be opened out and an accessory blade like one of the blades of the cephalotribe. After perforation the metallic drill is passed straight inside the skull and fixed into the base of the skull. A hole is made into the base of the skull by the drill which is then opened so that the bones of the base of the skull are fractured in many directions. A rotary movement facilitates this procedure. After the base has thus been destroyed the outer blade is applied tightly screwed and the basilyst tractor is then used for pulling the crushed head out of the pelvis.

The advantage of this instrument is that it destroys the base of the skull, reduces materially the size of the skull and also acts as an improvised cranioclast.

COMBINED CRANIOCLAST AND CEPHALOTRIBE

In this combined form of three bladed instrument the head can be crushed to a small size by simultaneously performing bisectomy and cephalotripsy. One blade is passed through the opening of the skull after perforation and this by a drilling movement destroys the base of the skull. The other two blades are applied on either side of the head and all the three blades are brought together by strong screws which when tightened crush the head. The three blades are kept in position by the two shoulders near the handle. When traction is gently applied the crushed head can be delivered without difficulty.

Prognosis Cases which necessitate these drastic methods of reduction of the size of the foetal head are generally cases which have been neglected and come to the notice of the obstetrician at a late stage of labour. It may be stated that the morbidity and mortality are definitely higher when these crushing operations are performed. It is rarely that such extreme measures are required for the delivery of the foetal head.

Decapitation

In this operation the head is severed from the trunk by cutting through the neck.

Indications (1) In cases of neglected shoulder presentation where the uterus is tonically contracted Bandl's ring is present with signs of imminent rupture of the uterus and the child is dead the safest method of delivery for the mother is decapitation.

(2) In some cases of locked twins when the after coming head of the first child is impacted by the head, shoulder or body of the second child.

(3) In double headed monsters where decapitation of one head is necessary before the delivery of the monster can be effected.

Technique Several instruments may be used to effect decapitation. It may be done either

- (1) By the use of hooks such as Braun's blunt decapitating hook, Ramsbottom's decapitating knife, Galabin's decapitating saw or Jardine's decapitating hook with cutting knife or
- (2) By the use of a long pair of sharp-edged blunt pointed scissors.

In cases of neglected shoulder presentation a sling is tied to the prolapsed arm and an assistant makes firm traction on it, so that the shoulder is fixed in the pelvic cavity and the neck comes nearer the pelvic outlet. The operator passes two fingers of his left hand

along the shoulder on to the groove of the neck, anteriorly. The decapitating hook is guided along the palmar aspect of the two fingers, and after it has reached the groove of the neck it is gently rotated through a right angle, so that the knob of the hook is directed posteriorly. The hook then grips the neck firmly, and by rotating the instrument the tissues are cut through and the spinal column disarticulated and completely separated. Where the separation of the soft parts cannot be easily effected by means of the blunt hook a pair of scissors may be used to divide them. It is important to realise that no sudden force should be exerted in cutting through or twisting the soft parts with the hook as otherwise it may slip and impinge upon some of the maternal soft parts and damage them.

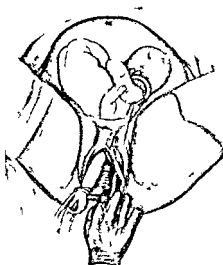


FIG. 195.—Decapitation. The hook *in situ*.

Note that the knob is directed posteriorly.

For the same reason the hook should never be passed with the blunt knob directed anteriorly, as if by any chance the hook should slip the knob may seriously damage the soft structures and even perforate the bladder.

Decapitation can be done with scissors, provided care is exercised in performing the operation so that the maternal soft parts or the operator's fingers are not injured. The prolapsed arm is pulled down by an assistant, the operator passes two fingers of his hand on to the neck, then the scissors are passed along the palmar aspect of the fingers and applied to the neck and gradually portion after portion is cut through, under the guidance of the fingers. We have practised decapitation with the use of the blunt pointed scissors and feel that, with a little caution, no accident need occur. The ordinary decapitating scissors however, are quite useless and

we prefer a straight fairly long pair of scissors sharp edged and blunt pointed. When decapitation is done with a pair of scissors the last few shreds of the tissues may not easily be cut through but if traction is made upon the arm that is already prolapsed, it will be easy to get the finger of the operator around these shreds and separate them or they may gently be cut with scissors.

EXTRACTION AFTER DECAPITATION

After decapitation has been effected traction should be exerted upon the prolapsed arm when it will be found that the foetal body is easily delivered.

After the delivery of the headless trunk, the head may be delivered by any of the following methods —

(1) By fundal pressure

(2) By passing two fingers into the mouth of the decapitated head and delivering it with fundal pressure and traction from below, as in the delivery of the after-coming head

(3) Applying a crotchet into the mouth of the foetus and by traction delivering it

(4) The head may be fixed by a vulsellum or by suprapubic pressure and the obstetric forceps applied and delivery completed

(5) In cases where there is any difficulty due to contracted pelvic perforation and extraction with the cranioclast or cephalotribe should be the method of choice

Cleidotomy

By this operation is meant the division of one or both the clavicles with a view to diminish the biacromial diameter of the dead foetus when there is difficulty with birth of the shoulders. It may be necessitated in cases of generally contracted pelvis or pelvis contracted at the outlet or it may be due to an excessively large child or an anencephalic monster. The head may have been delivered naturally or after perforation. The further progress is impeded by the shoulders becoming wedged in the pelvic cavity. When this happens the simple operation of cleidotomy may be performed by cutting through the clavicle with a pair of scissors passed under the protection of two fingers introduced into the vagina along the anterior aspect of the shoulder. Generally cleidotomy on one side is sufficient but in extreme cases it may be necessitated on both sides. After cleidotomy the child is delivered by traction on the head, or in some cases by traction on the head combined with traction exerted by a hook passed through the axilla of one side.

Occasionally in the delivery of a large macerated foetus particularly for instance in a diabetic patient the obstruction by the

shoulders is very pronounced. Any attempt after cleidotomy at traction on the head may lead to laceration of the macerated muscles of the neck and even separation of the head. Under such circumstances it may be necessary carefully to pass the hand into the vagina to one side, flex one forearm at the elbow, grasp the wrist and deliver the limb by gently pulling it out. There is then a better hold for traction and the wedge having been broken up the child

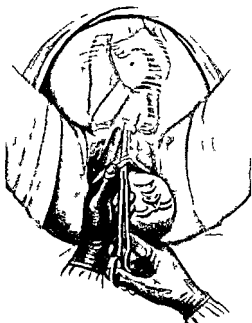


FIG. 106 — Cleidotomy

can usually be delivered. In some cases it is necessary to bring down both arms and then introduce a crotchet into the chest of the child and hook it against the ribs before finally extracting the macerated fetus.

Evisceration

By this is meant the opening of the thorax or abdomen or both and the removal of their contents.

Indications (1) In cases of neglected shoulder presentation where the arm is not prolapsed and the neck is not within reach for decapitation to be performed, evisceration is necessary before spondylotomy can be thought of.

(2) Where undue enlargement of the thorax or abdomen is present due to tumours, hydrothorax, congenital anomalies, foetal ascites, cystic kidney or distended bladder.

Technique The operation can be done with the perforator or with a straight or curved pair of scissors. Whatever instrument is used the maternal parts should be carefully protected from injury, and the instrument always guided along the fingers of the operator.



FIG. 197.—Embryotomy in a case of shoulder presentation.

passed into the vagina. When perforating through the thorax it is necessary to make a fairly big opening which can best be done by cutting away several segments of the ribs so as to make evisceration possible.

Spondylotomy

In this operation the spinal column of the foetus is divided and the trunk is cut into two halves.

This is done in cases of neglected transverse presentations where the neck is too high for decapitation to be performed and where the arm is not prolapsed. In such cases the uterus being in a state of threatening rupture and the child already dead version is absolutely contraindicated and the only safe method of delivery is to divide the trunk into two and deliver each half separately.

Mode of Operation The operator passes his fingers against the spinal column of the foetus and first cuts through the soft structures of the abdominal wall with a view to evisceration of its contents. The spinal column in the lumbar region can then be hooked round by the finger and with a powerful pair of scissors cut through into two halves. Further separation of any of the soft

structures can be easily done when the body has been completely divided into two halves each half being separately delivered by traction. The first half to be delivered should be the lower half of the foetal trunk and this can be done by applying a strong pair of vulsella on to the divided end of the spinal column and pulling so that the pelvis and lower extremities are extracted. Later the

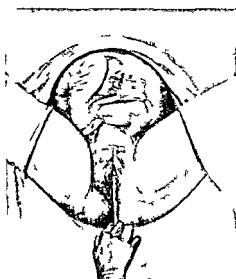


FIG. 138.—Spondylotomy. Delivery of the distal half of the body after spondylotomy.

upper half can be delivered by pulling upon the divided spinal column and extracting the trunk in a manner similar to that adopted in the delivery of a breech presentation. If any further difficulty arises in the delivery such destructive operations as cleidotomy or perforation may also have to be performed.

CHAPTER XLVIII

CÆSAREAN SECTION

Varieties. We have repeatedly referred in previous chapters to delivery by the abdominal route. There are several varieties of operation that may be undertaken when delivery by this route is decided upon. Chief among these are —

- (1) Elective or Classical Cæsarean section
- (2) Lower Segment Cæsarean section or laparo trachelotomy
- (3) Extraperitoneal Cæsarean section
- (4) Cæsarean hysterectomy (subtotal or total)
- (5) Porte's operation

The particular methods of operation to be chosen in any particular case depends upon a variety of circumstances which are considered later

Indications The indications for Cæsarean section may be broadly grouped under the following heads —

- (1) Faults in the passages
- (2) Faults in the passenger
- (3) Faults of the forces
- (4) Other maternal conditions

Before dealing with each of these separately it may be stated that the indications for Cæsarean section may be grouped as absolute or relative. An absolute indication is said to exist when it is impossible even for a mutilated fœtus to be delivered *per via naturalis* because of an extreme degree of contraction of the pelvis or because of tumours obstructing the passages or because of conditions in the vagina or of the cervix which make such impossible. A relative indication is said to exist when Cæsarean section offers the safer method of delivery of a live fœtus though methods of delivery through the natural passages are possible.

(1) **Faults in the Passages** In the large majority of cases Cæsarean section is performed because of faults in the passages which make it impossible for a live child to be delivered by the vaginal route or occasionally even for a dead and mutilated fœtus to be so born. Such faults may be

- (a) in the bony passages or
- (b) in the soft parts

(a) *Bony Passages* Contraction of the pelvis is the most common indication for Cæsarean section. Such contractions at the inlet cavity or outlet may be so pronounced that a full term normally developed fœtus cannot be delivered alive through the bony pelvis. It is not always easy however to judge of the possibilities of delivery through a contracted pelvis. As has been explained in the chapter dealing with contracted pelvis many other factors have to be considered. It is surprising how in some cases where pelvimetry alone would give the impression that a severe form of dystocia is likely to result delivery is effected by natural powers. This is due as has been stated already to several factors such as the size of the fœtal head in relation to the pelvic brim and cavity the degree of moulding the force of the uterine contractions and the efforts of the accessory muscles of labour. One cannot therefore lay down any specific rules as to when Cæsarean section should be undertaken in cases of contracted pelvis.

The border line cases therefore are the ones that present the greatest amount of difficulty and it is here that experience is valuable in enabling the obstetrician to arrive at a correct decision.

While cephalometry radiography and pelvimetry may all be available it should be emphasised that these are only of limited use and must be subordinated to the experience of the obstetrician concerned in arriving at a correct judgment.

It is for this reason that trial labour has come into vogue as one of the recognised methods of treatment in border line cases of contracted pelves. If the cases are carefully chosen a number of them which would otherwise have been submitted to Cæsarean sections will be found to deliver themselves through the natural passages either unaided or with slight help. A word of caution is necessary here as to the place of Cæsarean section in cases of trial labour. To allow a trial labour to continue where it is believed that delivery by Cæsarean section will almost certainly be necessary is bad management. If there is any weighty reasons indicating delivery by Cæsarean section before allowing the woman to go through trial labour it is more rational to perform an elective Cæsarean section in the best interests of mother and child. Cæsarean section even if by the lower segment route performed at a late stage in labour undoubtedly adds risks to the mother as compared with an elective Cæsarean and should not therefore be lightly undertaken. Unfortunately in some cases of test labour where there is every reason to believe that labour will ultimately end through the natural passages factors appear which prevent this favourable termination for example an unduly ossified head incomplete flexion failure of rotation weak uterine contractions or a resistant cervix. In such cases one may be forced to resort to a lower segment Cæsarean section but these should be few and far between. We therefore emphasise the fact that a lower segment Cæsarean section should not be thought of as the last resort of the obstetrician after other methods of delivery have been attempted and failed. In fact there has been an error of judgment which must be frankly recognised as such when Cæsarean section has to be resorted to under these circumstances.

The distorted types of contracted pelves may require an elective Cæsarean section and in such cases the difficulties of arriving at a correct appreciation of the nature of dystocia are much less. Such distorted types of pelves are the kyphotie pelvis the coxalgic pelvis Naegle's pelvis Robert's pelvis and the spondylolisthetic pelvis. The osteomalacic pelvis frequently results in such obvious deformities that there is no question about a choice of the method of delivery. The largest number of Cæsarean sections are generally carried out for this particular condition in countries where osteomalacia is common.

Contractions of the outlet sometimes lead to errors in judgment unless careful pelvic measurements of the outlet have been made previously. Even under such circumstances it is sometimes difficult

accurately to gauge the extent of dystocia that will develop, as with an outlet contraction the cephalic pole cannot be used as a pelvi-meter in the latter weeks of pregnancy or early in labour, as in cases of inlet contraction. For these reasons, the obstetrician should make it a rule to ascertain the exact dimensions of the pelvic outlet in all cases of primipare, and should, where such measurements are definitely contracted, decide early whether elective Cæsarean or pubiotomy, if necessary, will be the safer method.

There are some cases where, even with moderate degrees of pelvic contraction it is desirable to resort to a Cæsarean section, rather than allow labour to terminate through the natural passages, or watch the effects of trial labour. Among such conditions are elderly primiparæ with moderate contractions of the pelvis. The possibilities of a subsequent pregnancy in a woman past the middle age—certainly if over thirty-five years of age for Indian or over forty for European women—are somewhat remote and the obstetrician is justified in avoiding any risk to the child such as a vaginal delivery is bound to entail. Apart from such foetal risks, it has to be realised that in elderly primiparæ the soft parts are rigid and somewhat unyielding, the force of uterine contractions may not be as strong and effective as in younger women, and it is our experience that the foetus is frequently well developed—a combination of circumstances which render it more than probable that labour will be prolonged and the risks for the child consequently very much greater.

Other factors which may necessitate the choice of a Cæsarean section are complications, such as placenta previa, accidental hæmorrhage, prolapse of the cord, etc. When such complications exist along with a pelvis that is moderately contracted the chances of delivering a live child through the natural passages are very much diminished and in the interests of the foetus, therefore, it may occasionally be necessary to consider a Cæsarean section.

In extreme degrees of contracted pelvis, Cæsarean section is the only method of delivery available, irrespective of the condition of the foetus or the stage of labour.

(b) *Soft Parts* Certain anomalies of the soft parts may also necessitate Cæsarean section. Such may be due to defects in some part of the parturient canal, or to certain pathological conditions of the adnexa or the neighbouring organs, which materially diminish the dimensions of the parturient canal. Among the latter group of cases may be mentioned such conditions as

- (i) Tumours of the ovary, solid or cystic, particularly dermoid cysts, multilocular cysts, ovarian teratomata, fibromata etc
- (ii) Parovarian cysts
- (iii) Tumours of the bladder and rectum, stone in the bladder, etc

Conditions pertaining to the parturient tract are —

Fibroid tumours of the uterus, especially retroperitoneal and cervical fibroids, cancer of the cervix, atresia of the cervix cancer of the vagina, atresia of the vagina or old cicatrized scars sacculaton of the uterus cancer of the vulval outlet elephantiasis of the labium etc The necessity for resorting to Cæsarean section in such cases has already been elaborated in the chapter dealing with tumours complicating pregnancy

(2) **Faults in the Passenger** The faults in the passenger may be due to

- (a) Size of the foetus particularly of the head
- (b) Malpresentations and malpositions and
- (c) Monstrosities

Size of the Fœtus Occasionally one meets with an over developed foetus where there is a relative disproportion between the foetal head and the pelvis, or the excessive size of the foetus as a whole prevents the delivery through the natural passages Fœtuses weighing over 14 lbs generally necessitate the abdominal mode of delivery in the interests of the child An unduly ossified head as in cases of post mature children, is another factor that has to be taken into consideration in judging if Cæsarean section is the safest mode of delivery A hydrocephalus *per se* is never an indication for Cæsarean section The possibilities of survival of the foetus are remote and it is not justifiable to submit the mother to a major operative procedure on the off chance of delivering alive a hydrocephalic child, which has little or no prospect of future existence and will be mentally defective if it does survive

Malpresentations and malpositions may occasionally necessitate the consideration of Cæsarean section In those cases where malpresentations or malpositions are the direct result of some degree of contracted pelvis, it has already been stated that Cæsarean section may afford the safest mode of delivery It is not to be understood, however, that malpresentations and malpositions *per se* are indications for Cæsarean section The greatest amount of caution is necessary in arriving at a correct judgment and one should resist the temptation to resort to Cæsarean section as a convenient method of shelving the responsibilities of the obstetrician in such cases The ordinary modes of delivering the foetus *per vaginam* should always be considered first and only in exceptional cases, such as an extended breech in an elderly primigravida, or a transverse lie in a primigravid woman with a rigid and undilatable cervix, or a case of brow presentation with other anomalies such as prolapse of cord with an undilated cervix should it be necessary to consider the advisability of a Cæsarean section

Lastly, some types of *monstrosities* are better delivered through

the abdominal route, in the interests of the mother. Double monsters, such as dicephalic thoracopagi may give considerable difficulty even after embryotomy and particularly if they are complicated with conditions such as placenta prævia or other anomalies of the genital passages, one is justified if the diagnosis is made early in labour in resorting to a Cæsarean section.

It must be emphasised that foetal conditions *per se* are very rarely indications for a Cæsarean section and while in combination with other factors they may just tip the balance in favour of Cæsarean section care must be taken to see that too frequent resort to Cæsarean section is not indulged in, on the slender ground of foetal indications.

(3) **Uterine Forces** Occasionally, Cæsarean section may be indicated in those rare cases where a contraction ring forms. It may be an insuperable obstacle to the delivery of a living foetus through the natural passages. If the ring does not relax by any of the conservative methods advocated the question of a Cæsarean section in the interests of the mother or the foetus has got to be faced. A few cases of primary uterine inertia are also best treated by abdominal delivery.

(4) **Other Maternal Conditions** There are certain conditions where Cæsarean section is the most suitable method of termination of pregnancy in the interests of the mother and child. Prominent among these is *placenta prævia*. In cases of central placenta prævia, it is becoming increasingly recognised that it is safer both for the mother and the foetus to deliver by the abdominal route. In the other varieties of placenta prævia also complicated with a rigid cervix or in association with other abnormalities such as contracted pelvis the abdominal route offers a better prognosis for the mother and child and the obstetrician will have to weigh carefully the possibilities of safe delivery by either route.

In some cases of *accidental hæmorrhage* particularly of the concealed variety, Cæsarean section is indicated no matter what the condition of the foetus, in the interest of the mother. In the fulminant cases of concealed accidental hæmorrhage, the only possibility of saving the mother may be in the performance of this operation with or without subsequent hysterectomy.

The condition of the cervix particularly if it is undilated is another factor which may decide in favour of a Cæsarean section.

It is a moot point whether Cæsarean section has a place in the treatment of *eclampsia*. We do not subscribe to the view that rapid methods of delivery should be undertaken as a routine in the treatment of eclampsia and cannot therefore recommend Cæsarean section as a method of delivery with a view to cure the condition of eclampsia. We must however state that there are occasions when Cæsarean section may be indicated, particularly if there are other

complications present such as contracted pelvis or malpresentations that may give rise to difficulties in the delivery of the case

Cesarean section may sometimes be considered as a preferable mode of delivery in certain cases complicated with *heart lesions* or *tuberculosis* occasionally in cases of exophthalmic goitre or in certain cases of *chronic renal disease*

Contraindications The following contraindications for this operation should be borne in mind —

(1) When the child is dead or is in such a serious condition of distress as to render the possibilities of its survival remote unless there is an absolute indication for Cesarean section

(2) In cases where the patient has been obviously or possibly infected by previous examinations or unsuccessful attempts at delivery, unless the obstetrician is prepared to carry out a hysterectomy as well

(3) When the patient is a poor operative risk and is suffering from any secondary disease which renders the prognosis more serious if laparotomy is undertaken

Preparation of Patient In the elective or classical Cesarean section it is better not to subject the patient to any internal examination or if examination be absolutely necessary only the minimum number should be made. The patient should be prepared as for any other abdominal section. It is well that the patient be in hospital for a few days before the operation so that a careful examination may be made and the exact date of probable delivery calculated with a view to fix the date of operation. Cesarean section though it may appear a simple operation is best done in well-equipped institutions. If the patient has not been subjected to any vaginal examination it may not be necessary to apply any antiseptic internally. If however there has been interference it is advisable to swab the vaginal cavity with an antiseptic such as violet green or mercurchrome before the patient is taken to the table

Time for Operation It has now been definitely proved that the later in labour the operation is performed the greater are the risks. The optimum time for operation depends upon several factors. In emergency cases one may have no alternative but to operate as soon as it is possible to do so. But where the elective Cesarean section is performed it is better that the operation be done either on the date of probable delivery or as soon as labour begins. We prefer operating on a particular date calculating the day as near as possible to the probable date of confinement as under such circumstances the patient can be submitted to a more elaborate preoperative preparation all the facilities necessary for the operation will be available and the operation can be done without any hurry. Where institutional facilities are available by

day and by night it is possible to operate as soon as the patient goes into labour. We have found no difficulty and experienced no complications when performing the operation before the onset of labour. The theoretical objections of imperfect lochial drainage or lack of efficient uterine contraction and retraction, are not met with in practice. One difficulty in operating before the onset of labour is that it occasionally happens that the probable date of delivery is not accurately gauged, so that the patient is delivered of a child that is not fully developed. The obstetrician should remember this possibility and should take every precaution in ascertaining the probable date of delivery, and if he be not certain of it it is well to wait for the onset of labour before operating.

Technique of Operation

CLASSICAL CÆSAREAN SECTION

After the preliminary preparations the patient is brought to the table and anaesthetised. The choice of the anaesthetic is a matter for the obstetrician to decide. A general, local or spinal anaesthesia may be used. In patients with cardiac disease, tuberculosis or any condition of shock and collapse from placenta prævia or accidental hæmorrhage, the use of a local anaesthetic should be considered.

After the abdominal wall has been properly prepared and the bladder emptied, the area of operation is painted with an antiseptic. Sterile towels and sheets cover the abdomen, except at the field of operation. Besides the anaesthetist, three assistants are required to help at the operation: one to assist the obstetric surgeon, one to hand the instruments, and one to take charge of the baby as soon as it is delivered.

An incision is made in the middle line of the abdominal wall about six inches in length, the greater part of the incision being below the umbilicus. Having opened into the abdominal cavity, the uterus is found directly underneath the incision. There is no necessity to lift the uterus out of the abdominal cavity. The objection to such a procedure is that the abdominal incision has to be much longer. Eversion of the gravid uterus is not necessary in the classical or in the lower segment Cæsarean section. The uterus may be lying more to one side than the other, generally being pushed to the right side. The assistant must bring it into the median line so that the incision into the uterus may be exactly in the median line of its anterior wall. The abdominal cavity is now packed off with gauze rinsed in saline solution, so that when the uterus is opened into little of the material may gravitate into the abdominal cavity. With the uterus *in situ* an incision is made in

the median line of from $5\frac{1}{2}$ to 6 inches. The abdominal wall can be retracted to allow of this incision being made more easily and deliberately.

Just before incising the uterus it is desirable to give 1 c.c. of pituitary extract hypodermically, to favour uterine contractions and retractions after delivery. As soon as the uterine cavity has been opened into the operator incises the membranes, passes his hand inside, catches hold of the child by one foot and extracts it. If the uterine incision is not sufficiently long difficulty may be experienced in the delivery of the after coming head. It is better under these circumstances to pass two fingers into the uterine opening and enlarge the incision by means of scissors guided by the fingers in the uterine cavity. As soon as the child has been delivered the cord is clamped in two places and cut between and the child handed over to the third assistant. Immediately after the delivery of the child the uterus is brought out of the abdominal cavity and anteflexed over the symphysis pubis. In this position the uterine vessels are knifed, the blood supply is considerably diminished, and time is given for the uterus to recover its tonus so that it may contract and retract efficiently after separation of the placenta.



FIG. 199 — Abdominal Caesarean section classical

The abdomen has been opened and the line of uterine incision shown

The incision into the uterus should preferably be as low down as possible. Occasionally the placenta may be in front and severe hæmorrhage may be encountered. The operator should not be unnerved by this hæmorrhage but should boldly pass his hand into the uterine cavity, going to one side of the placenta or through the incised organ, rupture the membranes and then seize the child by the foot and deliver it. As soon as the child is delivered the hæmorrhage generally stops. After allowing the uterus to rest for a couple of minutes the placenta should be expressed by squeezing the fundus and pushing the placenta out through the uterine incision. If this is not possible the placenta is gently separated by means of fingers and removed with care so that the membranes are also removed entire. Particular caution is necessary to see that the membranes covering the internal os are removed entire by passing one finger as far back as possible to the internal os and separating the

membranes before they are removed. Immediately after the removal of the placenta $\frac{1}{4}$ cc of pituitary extract and 1 cc of ergotin may be given hypodermically. If the hemorrhage does not stop the uterus is squeezed by wrapping it with sterilised hot towels rinsed dry and compressing the organ. In the large majority of cases the hemorrhage stops promptly. Where the bleeding continues owing to the laxity of the uterine musculature an injection of 1 cc of pituitary extract should be given directly into the uterine muscle. This helps to promote efficient contraction and

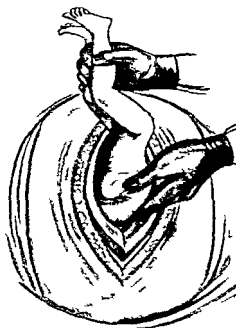


FIG. 900.—Delivery of the child through the uterine incision.

retraction. In such cases the suturing of the uterine incision helps to control the hemorrhage and should be begun at once.

Considerable discussion has arisen as to the best method of suturing the uterine incision and what material should be used. We have come to the conclusion that so long as sutures are applied to include almost the whole thickness of the uterine musculature and to bring the edges into close coaptation it does not matter what method of suturing is adopted. Similarly with regard to the suture material provided it is perfectly sterile and is not rapidly absorbed it does not matter much what material is used and perhaps it depends upon the individual operator's preference. We prefer silk and have had no cause to regret its selection.

One of the chief objections raised against the classical Cæarean

section is the possibility of rupture of the Cæsarean scar at a subsequent pregnancy. We have never experienced this and we believe if the suturing is properly done and if sepsis is not a complication after the operation rupture should be extremely rare.

Method of Suturing Whatever be the method of suturing adopted it is exceedingly important to note that the endometrium of the uterus is not included in the suture. The muscular wall may be closed in a single layer of sutures or in two or three layers. When a single layer of sutures is the method adopted the suture should include almost the whole of the thickness of the uterine wall excepting the endometrium. Deep sutures six to eight in number may be applied and in between superficial sutures to bring the edges into close apposition.

Another method of suturing is to put in deep sutures for the uterine musculature and superficial sutures to bring the peritoneal edges together. In some cases after suturing the uterine musculature a row of continuous sutures with catgut may be applied to cover the peritoneum over the incised area.

Among the materials used for suturing are chromicized catgut, silk, silkworm gut, linen thread etc.

As soon as the uterus has been properly sutured it is well to apply a hot towel rinsed in warm saline and to squeeze the uterus so that any blood clots collected inside may be expressed through the cervical canal. The uterus is then returned into the abdominal cavity. The peritoneal cavity is cleared of any blood clots, particular care should be taken to see that any blood clots in the lateral fossæ and in Douglas pouch are cleared out. Omentum is placed behind the uterus and the abdomen is then closed in layers by suturing the peritoneum, the muscles, fascia and skin separately. After applying sterile dressings to the wound the vaginal outlet should be protected by an antiseptic pad and the patient returned to bed.

DIFFICULTIES AND COMPLICATIONS

Difficulties and complications may arise in the course of a Cæsarean section. These are —

(1) **Actual Delivery** The head may be engaged in the brim of the pelvis and difficulty experienced in extracting it. The uterine incision may have to be extended towards the symphysis pubis and with traction on the legs and gentle manipulation if necessary by passing a finger into the mouth of the foetus the head is delivered.

(2) **Placenta** We have already referred to the difficulty experienced when the placenta is in front and the mode of delivery of the child to be adopted in such cases.

(3) **Hæmorrhage** Bleeding is usually controlled by injections of pituitary extract and ergotin or by direct pressure upon the

uterus aided by hot sponges or towels rinsed dry in saline. Care must be taken to see that hæmorrhage is completely controlled and the uterus properly retracted before replacing the organ in the abdominal cavity. But rarely—and particularly in cases where Cæsarean section is resorted to for concealed accidental hæmorrhage the bleeding may be so severe that nothing short of extirpation of the uterus will control it. The occurrence of hæmorrhage should not interfere with the process of suturing as this materially helps in controlling the bleeding both from the incised surfaces as well as from the placental site. In some cases direct injection of pituitary extract into the uterine musculature helps to produce proper contractions and retractions of the organ and thus arrest the hæmorrhage.

(4) *Infection*. We shall deal later with the measures that are necessary in cases where the genital passages are obviously or possibly already infected. The classical Cæsarean is contraindicated in such cases. In cases where infection is suspected during a classical Cæsarean section the question has to be considered whether it is not desirable to remove the uterus or alternatively to take such precautions as may be necessary to prevent the onset of peritonitis. Swabbing the inside of the uterus and the incised wound with an antiseptic such as violet green, drainage of the peritoneal cavity, injection of antistreptococcal and antiperitonitic or gas gangrene serum etc. may have to be undertaken in such suspect cases.

(5) *Adhesions*. In cases of repeat Cæsarean section one should be prepared to meet with adhesions. The adhesions may involve the intestines or a portion of the omentum and even the anterior abdominal wall. It is not desirable to attempt to separate all these adhesions at the time of the Cæsarean section should they be extensive as considerable delay may occur and the chances of uterine bleeding may be increased. A clear area on the uterine surface is selected or prepared for the incision as near as possible to the median line and the child and placenta delivered. After delivery of the foetus and placenta and control of the uterine hæmorrhage the adhesions may be separated as far as is consistent with the general condition of the patient.

During the puerperium the usual treatment adopted for cases of laparotomy should be observed. The chief complications are peritonitis, intestinal obstruction and septic complications. Should there be any signs of peritonitis the abdomen should be reopened and drained. Intestinal stasis or paralytic ileus is a troublesome complication and is perhaps more frequent with cases of classical Cæsarean section particularly if there is any slight degree of sepsis. In the majority of cases the obstruction is due to the paresis of the gut. Such distension should be treated by enemata particularly turpentine enemata given every four hours by bowel washes or by

injections of prostigmine and acetylcholine. Acute dilatation of the stomach may sometimes occur and requires gastric lavage.

LOWER SEGMENT CÆSAREAN SECTION

This operation has now come to be recognised as a valuable method of delivery, allowing a much larger number of cases to be delivered by the abdominal route than was possible a decade or two ago when the classical Cæsarean section was the only alternative available to the obstetrician. The *advantages* of this method over the classical section are —

(1) It is safer in cases where infection is suspected.

(2) It can be done and is in fact more easily performed when the patient has been in labour for some time whereas with the classical section the mortality increases with the number of hours the patient has been in labour.

(3) The after treatment is much simpler and complications such as vomiting, intestinal stasis and peritonitis occur much more rarely than with the classical operation.

(4) It has been stated that the sutures can be more closely applied in the lower segment Cæsarean section and that the incised area is at rest during the puerperium so that there is much less chance of escape of any lochial discharge through the wound into the general peritoneal cavity. Again in the classical section the alternative contractions and relaxations occurring in the upper uterine segment naturally put a strain on the sutures and do not allow the wound to heal so perfectly. Hence rupture of the uterus in subsequent labour is said to be more common after the classical operation and rarer after a lower segment Cæsarean where the healing of the incision is more perfect.

(5) The greatest advantage of a lower segment section is that it may be performed after the woman has had a test labour when the classical section is more risky.

As against these advantages it may be stated that the lower segment Cæsarean section involves a more elaborate technique and cannot therefore be performed by those not well experienced in the surgery of the abdomen. We must also state that we would not recommend this as an operation of choice in every case as undoubtedly the classical operation if done at the time of election in suitable cases does offer a more favourable prognosis to the patient.

Technique. The patient is prepared as for the classical operation, the bladder is emptied by a catheter and the patient placed in a moderate Trendelenburg position. The abdomen is opened in the mid line by an incision which should extend from as near the symphysis pubis as possible almost to the umbilicus. It is wise to carry the incision as low as possible as then the whole of the lower

uterine segment can be properly exposed by retraction of the abdominal walls. The uterus is then exposed and the surrounding area picked off with gauze wrung out in saline. The peritoneum on the anterior wall of the uterus, just above its reflection over the bladder is then caught hold of loosely by a dissecting forceps and a transverse incision made over the peritoneal investment at this level, extending from one side of the anterior uterine surface to the other. The peritoneum thus divided is then lifted up and by means of the finger, covered with a piece of gauze, the peritoneum and the bladder in front are separated from the uterine wall and pushed as low down as possible. In a similar manner the peritoneum is

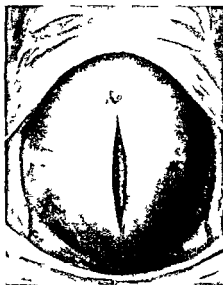


FIG. 201.—Lower segment Cesarean abdominal incision.

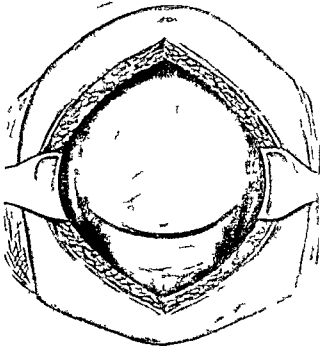


FIG. 90° Lower segment Caesarean. Uterus exposed and a transverse incision made just above the bladder.

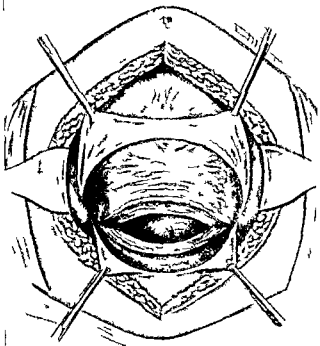


FIG. 93 — Lower segment Caesarean. The lower segment incision made exposing the scalp of the child.

uterine segment can be properly exposed by retraction of the abdominal walls. The uterus is then exposed and the surrounding area packed off with gauze wrung out in saline. The peritoneum on the anterior wall of the uterus just above its reflection over the bladder is then caught hold of loosely by a dissecting forceps and a transverse incision made over the peritoneal investment at this level extending from one side of the anterior uterine surface to the other. The peritoneum thus divided is then lifted up and by means of the finger, covered with a piece of gauze the peritoneum and the bladder in front are separated from the uterine wall and pushed as low down as possible. In a similar manner the peritoneum is

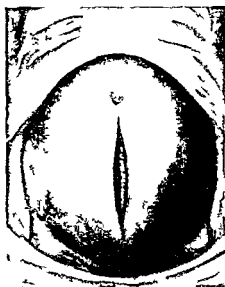


FIG. 901.—Lower segment Cesarean abdominal incision

reflected above as far as possible up to the level of its firm attachment to the uterine wall. By thus reflecting the two flaps of the peritoneum above and below, the entire lower uterine segment and portion of the upper part of the cervix become exposed. At this stage the uterus may be opened into either by a curvilinear transverse incision or a vertical incision. Occasionally the vertical incision if it is not sufficiently long for the delivery of the foetal head may extend towards the bladder during the process of delivery of the foetus and thus give rise to troublesome hemorrhage. After opening into the uterus either by the vertical or transverse incision the assistant can by fundal pressure press the head of the foetus if it be a cephalic presentation through the uterine incision and the child can thus be delivered. In some cases the palm of the hand may be used to lever the head out while the assistant helps with

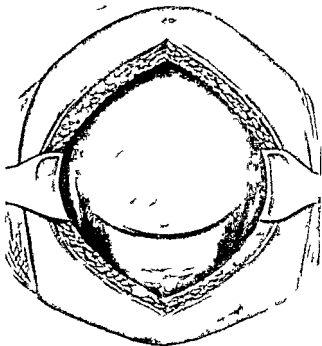


FIG. 202 —Lower segment Caesarean. Uterus exposed and a transverse incision made just above the bladder.

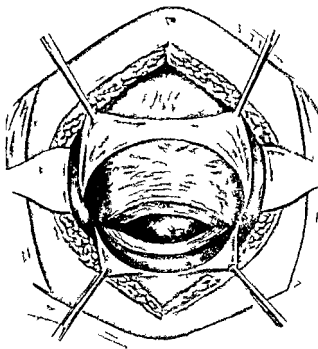


FIG. 203 —Lower segment Caesarean. The lower segment incision made exposing the scalp of the child.

fundal pressure Occasionally one blade of the forceps may be used for this purpose The forceps may be applied and the head extracted through the uterine incision We think that this step is unnecessary The head can also be seized by Willett's forceps applied to the scalp and gently pulled through the opening Care should be taken before delivery of the head to see that the incision is sufficiently long to allow the head to be delivered without it tearing the lateral extremities of the wound in an irregular manner

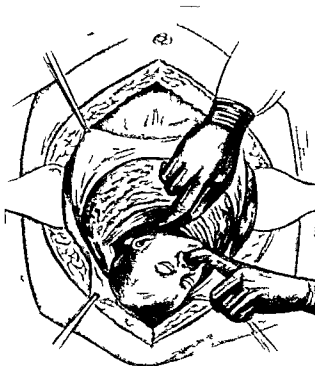


FIG 904 —Lower segment Cesarean Delivery of the child through the incised opening

Once the head of the child has been delivered the rest of the body follows with ease

As soon as the child is delivered an injection of pituitary extract is given the placenta may then be expressed or removed manually and all clots carefully cleared out Once the placenta has been expressed and the uterus is contracted the incision is closed by continuous or interrupted catgut sutures care being taken to see that the cut edges are approximated in order to control hæmorrhage as well as have correct apposition In some cases as an additional safeguard a second row of sutures may be applied The peritoneal flaps are then brought into apposition by continuous catgut suture The abdominal wall is then closed in layers in the usual manner

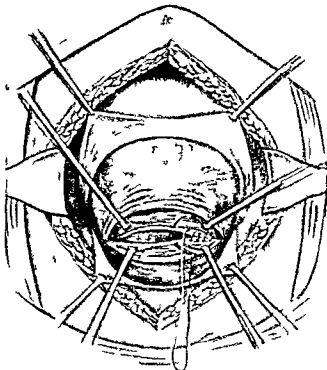


FIG. 65—Lower segment Cesarean. The method of suturing layers of the lower segment incision.

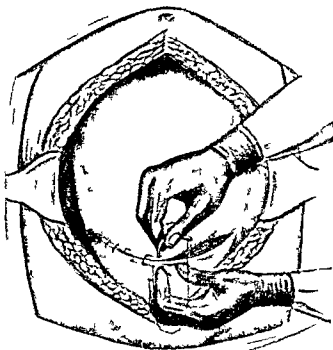


FIG. 66—Lower segment Cesarean. Suturing of the peritoneal coat of the lower segment.

In the absence of infection the convalescence in these cases is somewhat smoother than after the classical Cæsarean section

Complications (1) Injury to the bladder is particularly likely to occur if a vertical incision in the uterine wall extends low down

(2) Irregular tears of the uterine wall may involve sometimes the uterine vessels especially as the result of a small transverse incision The tear extends during the process of extraction of the foetal head Care must be taken before extraction of the head to see that the incision is sufficiently long and if there be any difficulty the incision should first be extended before delivery of the head

(3) Hæmorrhage is sometimes a very troublesome complication Nothing unnerves the surgeon so much as thereby the field of operation is not clearly in view by careful technique this should be avoided

EXTRAPERITONEAL CÆSAREAN SECTION

The object of this operation is to avoid opening into the peritoneal cavity and it is therefore generally indicated in cases where there is an obvious risk of sepsis The true extraperitoneal Cæsarean section is not an easy operation and involves a considerably more elaborate technique than the one needed either for a classical or lower segment Cæsarean section It is an alternative to Cæsarean hysterectomy and should therefore be employed particularly in young mothers

Technique After the patient has been prepared in the usual manner and anæsthetic given the bladder is distended with a moderate quantity of fluid so that it can easily be recognised and the subsequent procedure of separating the peritoneal investment can be carried out under favourable conditions The abdominal wall is incised by a median vertical incision down to the peritoneal investment By blunt dissection the peritoneum is gently separated from the bladder the bladder is emptied and pushed down as far as possible from the lower uterine segment The uterovesical fold of peritoneum is pushed upwards by gauze dissection great care being taken to see that it is not perforated By so pushing the peritoneum upwards and the bladder downwards a sufficient surface on the uterus uncovered by peritoneum is exposed The lower uterine segment is then incised either by a vertical or a transverse incision The head is gently grasped by Willett's forceps or pressed into the incised opening and levered out by introducing a finger into the mouth of the foetus Care should be taken to see that in the delivery of the foetus the incision in the uterus does not extend irregularly and if the opening be too small it is better to enlarge it by cutting through with a pair of scissors Should the tear extend irregularly there is risk of opening up the peritoneal cavity or of the tear extending into the bladder After delivery of the foetus the placenta can be easily

expressed. An injection of pituitary extract followed by ergotin citras may be given at this stage. The uterine incision is closed by interrupted sutures, the bladder is brought into position and fixed by two or three stay sutures to the reflected peritoneal investment, a gauze drain is put into one side of the incision and the abdomen closed in layers.

The after care of the case is similar to that of a lower segment Cæsarean section.

RADICAL CÆSAREAN SECTION

(Or Cæsarean Hysterectomy)

In this operation after extraction of the fœtus through the abdominal route the uterus is removed. This may be done either by a total hysterectomy or by a supravaginal i.e. subtotal hysterectomy.

Indications. The removal of the uterus in a woman of the child bearing period should not be lightly undertaken, but occasionally it is necessary for the sake of the mother to perform an operation of this nature. The indications for Cæsarean hysterectomy are —

(1) When a Cæsarean section is done because the uterus contains multiple fibroids where enucleation is not possible or attended with considerable risks.

(2) In all cases complicated by operable cancer of the cervix.

(3) In cases of inoperable cancer of the cervix to prevent the risk of infection of the uterus after Cæsarean section from the fungating cervix.

(4) In some cases of rupture of the uterus the result of obstructed labour.

(5) In some cases of concealed accidental hæmorrhage where the uterine body is so diseased that it is impossible effectively to promote contraction and retraction and so control bleeding.

(6) In some cases of severe atony of the uterus following a Cæsarean section.

(7) In cases where in the interests of the child the abdominal method of delivery is undertaken where there is already evidence of uterine infection.

(8) In some cases of placenta prævia.

The question whether a supravaginal or a total hysterectomy should be undertaken will depend upon several factors. A total hysterectomy should be performed in the following conditions —

(1) In septic infections of the uterus. In cases where infection is suspected the cervix is a focus of such and its removal thereby reduces the maternal risk of peritonitis or septicæmia.

(2) Rupture of the uterus.

(3) In cases where pregnancy is complicated by cancer of the cervix in an operable condition.

Some would advocate a total hysterectomy in every case for the reason that it is not advisable to leave the cervical stump which may at a later stage give rise to other complications, such as development of malignant growths. On the other hand, it should be realised that a total hysterectomy following Cæsarean section does involve a greater amount of shock to the patient, besides taking longer to do and also carrying a greater risk of hæmorrhage. It need not be undertaken as a matter of routine and except under the circumstances already stated where it is a necessary procedure the question should be decided upon the general condition of the patient and the circumstances under which the operation has to be undertaken.

Technique If a hysterectomy is decided upon the child is generally delivered by a classical Cæsarean section. The cord is then clamped as close to the uterine opening as possible and severed and a few deep sutures are inserted to close up the uterine opening. The uterus is then pulled up by grasping the fundus by a volsellum. A transverse incision is made over the peritoneal investment near its reflection from the bladder on to the anterior wall of the uterus, and the bladder gently separated and pushed down by gauze dissection. The broad ligaments are now double clamped either medial to or lateral to the ovaries depending on whether these are to be conserved or removed. The thickened round ligaments are also clamped each in two places. The broad ligaments and round ligaments are cut into between two clamps on either side up to the level of the cervix. The uterine artery on either side is double clamped the points of the forceps being directed downwards and inwards so as to grasp a portion of the wall of the cervix. After cutting through between the forceps the uterus is amputated at the level of the isthmus taking care that the bladder is not in any way near the line of incision. The cut edges of the cervix anteriorly and posteriorly are caught by means of volsella while the uterine body is completely separated from the cervix. The cervix is lifted up by the two volsella on its anterior and posterior walls ligatures are applied to the portions of the broad ligaments already clamped, and the uterine arteries are tightly ligatured. The cervix is then closed by approximating the anterior and posterior lips by means of interrupted sutures and the raw area peritonised by a continuous suture of catgut bringing the loose flap of peritoneum lying anteriorly to the posterior layers of the broad ligaments and back of cervix.

Where a total hysterectomy is undertaken after delivery of the foetus by Cæsarean section the uterine wound is sutured, an incision is made just above the uterovesical pouch and the peritoneum dissected below, so as to free the bladder completely from its cervical attachment. The broad ligaments are clamped as in a subtotal hysterectomy, but instead of cutting through the cervix, the

amputation incision is made on the anterior and posterior vaginal fornices and the cervix with the uterine body completely removed by cutting through the vaginal walls all round the cervical attachment. The vagina is closed with a layer of interrupted catgut sutures after the broad ligaments and the vessels have been tied with ligatures. Peritonisation of the raw area is carried out as in the supravaginal operation and then the abdomen closed in layers.

PORTE'S OPERATION

This operation has recently come into vogue and presents great possibilities under certain conditions particularly in tropical countries where neglected cases are more frequently met with.

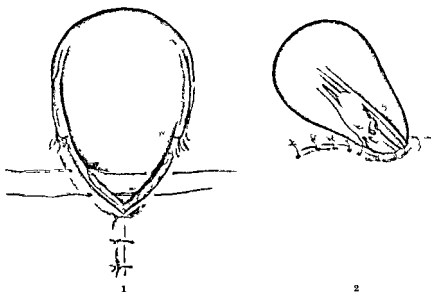


FIG. 207.—Porte's exteriorisation of the uterus

- (1) The gravid uterus has been brought out of the abdominal cavity and the abdominal wall stitched around. (2) Anteroposterior and lateral views.

Technique In this operation the unopened gravid uterus is delivered outside the abdominal cavity. The parietal peritoneum is closed behind and stitched to the sides of the cervix and the abdominal wall sutured tightly. The uterus is then opened into the foetus delivered and the placenta removed. The uterine incision is closed with interrupted sutures and the uterus protected with sterile dressings is allowed to involute outside the abdominal cavity. After a few weeks when the woman has recovered from the effects of the operation and the signs of sepsis have abated the abdomen is reopened, the uterus is replaced and the abdomen closed in layers.

The operation possesses the advantage that risks of infection of the peritoneal cavity are reduced to a minimum and the uterus is saved. Cases have been reported where a subsequent pregnancy has occurred. This operation has not been extensively performed but presents an attractive alternative to Cesarean hysterectomy.

POST MORTEM CESAREAN SECTION

Sometimes the foetus lives for a few minutes after the death of the mother and it is quite possible to save the life of the child if an immediate Cesarean section is done. Where either religious beliefs or customs of the land necessitate the delivery of the foetus before disposal of the dead body of the mother it is a question whether greater advantage should not be taken of immediate post mortem Cesarean section. The difficulty is to be certain that the mother is dead and the practitioner must guard himself against the criticism that the operation has hastened the death of the patient. In a few cases children have been saved by such an operation.

REPEAT CESAREAN

The widely prevalent maxim that 'Once a Cesarean section always a Cesarean section' has been proved to be not quite accurate. We have had several cases and many more have been recorded in the literature where a woman has been able to deliver through the natural passages a live full term child after a previous Cesarean section. This is to be expected when a Cesarean section has been performed for indications other than contraction of the pelvis or obstruction from other causes to the genital passages. Where no contraindications exist it has been our practice to leave a case of previous Cesarean section to deliver herself *per vaginam* provided a hospital delivery is arranged for so that the patient can be carefully watched throughout labour and any emergency dealt with in a properly equipped theatre. In such cases no ecboics such as pituitary extract ought to be given and it is well to terminate the second stage of labour as soon as possible by the application of forceps or by extraction of the foetus if the breech is presenting as thereby excessive strain on the uterine scar is avoided. We have already referred to the possibilities of rupture of a Cesarean scar but we hold that with a proper and careful technique in the suturing of the uterine incision at the section this should be an exceedingly rare complication provided there has been no sepsis during the puerperium which would interfere with the healing up of the wound. In some cases however a repeat Cesarean section is inevitable as the same indication that necessitated the former Cesarean is present in the subsequent pregnancy e.g. disproportion.

The number of times a Cæsarean section can be safely performed on one woman depends upon several factors. Cases have been recorded where Cæsarean section has been performed seven times. We have done as many as four on the same woman but we are inclined to the view that Cæsarean section repeated so frequently puts a heavy mental and physical strain on the patient. If the previous children are alive we prefer to sterilise a patient after three sections.

Whether a Cæsarean section can be safely repeated at a future pregnancy and how often this can be done depends to a large extent upon the degree of adhesions present and the nature of the uterine musculature as judged at the previous Cæsarean section. A fact of much importance because of the possibility of having to perform a repeat Cæsarean section is to see that after the uterus has been sutured it is left in the abdominal cavity with no omentum lying in front of the sutured wound.

STERILISATION AT CÆSAREAN SECTION

This procedure should not be lightly undertaken. In most cases it is undesirable to sterilise a woman after one pregnancy. The uncertainties of life connected with the new born child and the problems created by the psychology of the only child must be a sufficient warning to the obstetrician not to yield easily to the patient's request to sterilise her after her first child has arrived. With modern technique the dangers of a repeat Cæsarean section should be little. At the same time as we have already stated it is necessary to realise that we are dealing with human temperaments and human emotions and in subsequent Cæsarean sections we are inclined to leave it to the patient to decide after the case has been fully presented to her whether sterilisation should be effected or not.

Where sterilisation is indicated or demanded the method employed should be such as to leave no possibilities of a subsequent pregnancy occurring. Mere ligation of the tubes or even resection of a portion of the tube is not absolutely certain. The best method is to remove the whole Fallopian tube including the interstitial portion by excising the uterine cornu. Invaginate the stump of the broad ligament and close up the uterus by means of sutures.

We do not recommend sterilisation by a supravaginal or total hysterectomy. The onset of the artificial menopause and the absence of the uterus probably play an important factor in the sexual life of the woman and are points for consideration before hysterectomy is undertaken. Moreover a hysterectomy is an unnecessary procedure simply for purposes of sterilisation.

PROGNOSIS

With improved technique, the prognosis after Cæsarean section should be very much more favourable now than it was twenty or thirty years ago. It is unfortunate, however, that when a large series of cases are reviewed the mortality rate is still found to be high. This is due to two factors—an incorrect appreciation of the indications for this operation and an unfortunate tendency to resort to this procedure when all other methods of delivery have failed. A factor which greatly influences the prognosis is the time at which the operation is undertaken. It has been shown by Eardley Holland, in an exceedingly valuable analysis of nearly 2000 cases of Cæsarean section performed in some of the British hospitals, that the prognosis is most favourable when the operation is done either before labour or early in labour. The later the operation is performed the graver becomes the maternal risks, and the worst prognosis is in those cases where Cæsarean section is done after unsuccessful attempts at delivery by other methods have been made.

The prognosis is also influenced by septic complications. While the lower segment Cæsarean section has certainly improved the prognosis in some of these conditions it should be clearly realised that there is still a risk even when it is resorted to, though that risk has been shown to be less than after the classical operation.

In cases where Cæsarean section is necessitated for conditions like placenta prævia and accidental hæmorrhage the prognosis will depend upon the general condition of the patient at the time of the operation and where the patient has been very much devitalised by the loss of blood the prognosis is grave.

The radical section must inevitably give a worse prognosis, for the obvious reason that it is adopted in patients with complications and in a worse state of health, but it should also be realised that in these cases the alternative method of treatment would give a somewhat higher percentage of mortality.

The presence or absence of other complications in the mother are also material factors in influencing the prognosis. One cannot help remarking that the furore for a Cæsarean section must be checked if an unnecessary increase in maternal mortality is to be avoided.

The subsequent rupture of a previous Cæsarean section uterine scar has been much discussed. It has been stated that this possibility is greater after classical Cæsarean section than the lower segment operation. Much depends upon the method of suturing adopted. That the lower segment Cæsarean scar need not necessarily be more resistant is obvious from the observations of DeLee, Nadelhoffer and Greenhay, who state that in several cases of laparo trachelotomy they found the old incision just on the point of rupture. It is for

this reason the dictum—"Once a Cæsarean, always a Cæsarean" has come to be generally accepted. But this is not necessarily so, and in several cases we have had successful natural deliveries following a previous Cæsarean section where that section was performed for conditions other than for an absolute indication due to pelvic contraction.

A point to be considered in this connection is the occurrence of sepsis during the healing of the Cæsarean scar. This undoubtedly interferes with proper healing of the uterine incision and leads to weakness of the scar.

The prognosis in cases of repeat Cæsarean sections depends very much upon the presence or absence of adhesions consequent upon the previous section. Many adhesions increase the technical difficulties of the operation and during their separation injury to bowel may result. Repeat Cæsarean sections are generally necessitated where the operation has been resorted to owing to definite pelvic contraction.

VAGINAL CÆSAREAN SECTION

This is an operation by which delivery is effected after opening into the uterus through the vaginal route.

Indications The operation is sometimes indicated during labour when immediate delivery is called for or where a rigid cervix does not permit of easy dilatation.

Under the first indication come such conditions as —

- (1) Placenta prævia
- (2) Abruptio placentæ
- (3) Certain cases of eclampsia
- (4) Hyperemesis gravidarum
- (5) In patients with diseases of the heart or lungs
- (6) Some cases of prolapse of the cord if the cord is pulsating

Under the second indication, when the operation is done to overcome certain conditions of the soft parts causing obstruction to delivery, may be mentioned —

- (1) Organic rigidity of the cervix, developmental in origin or the result of cicatrization from previous operations
- (2) Sacculaton of the uterus, anterior or posterior
- (3) Certain cases of prolapse of the gravid uterus

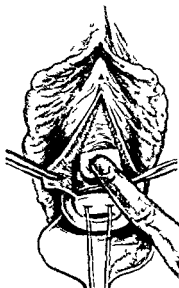
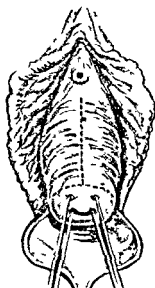
Conditions (1) Certain conditions should be satisfied before a vaginal Cæsarean section is thought of. The most important of these is that the pelvis be normal. It should never be done in cases complicated by a contraction of the bony pelvis. The operation can therefore be done only where it is possible to deliver the fœtus by the vaginal route without any increased risk to the fœtus.

(2) If the operation is not done solely in the interests of the mother the child should be alive

(3) The soft tissues should not be sodden or œdematous

The *advantages* of a vaginal Cæsarean section over other methods are —

- (a) In suitable cases it affords a rapid method of delivery, unattended with much shock,
- (b) In cases where septic complications are present it is much better to deliver by the vaginal route than by the abdominal route
- (c) In cases of stricture of the cervix, it is a very suitable operation, as it does not expose the woman to the risks incidental to an abdominal section, and the subsequent convalescence is more rapid



injection of pituitary extract and ergotin, or other suitable ecbolics. In some cases, however, particularly if the section is done at term, with a well developed fœtus, the anterior incision is not sufficient to permit of easy delivery. Under such circumstances an incision is made in the posterior lip of the cervix as well. The posterior vaginal vault is incised transversely, and the peritoneum of the pouch of Douglas defined, separated, and pushed up, thus exposing the posterior wall of the cervix and the lower uterine segment. The posterior lip of the cervix is then incised in the middle line. With the anterior and posterior walls thus opened out, dilatation is sufficient to effect the delivery of the full time fœtus. The posterior incision should be treated in a similar manner to that of the anterior, after the placenta has been expressed.

Vaginal hysterotomy offers great advantages in certain cases, as a clean incision is made, a perfect repair can be done, and hæmorrhage controlled while the peritoneal cavity is not opened into. Difficulties may, however, be experienced if the incisions are too short or deviate from the mid line, and profuse hæmorrhage may occur if irregular lacerations develop during the course of the delivery because small incisions have been made. The paravaginal incision should be repaired in the usual manner.

If vaginal hysterotomy is performed before the sixth month, it is hardly necessary to make a paravaginal incision, and then anterior incision of the cervical canal and the lower uterine segment is sufficient for purposes of delivery. In fact, if the pregnancy is advanced to more than sixteen weeks, this method of delivery affords great advantages over the alternative method of vaginal delivery by dilatation of the cervical canal.

Future pregnancies and labours need not be complicated, and many cases have been reported where, after a vaginal Cæsarean section subsequent child birth has been normal. In cases where the incised wounds do not heal completely, particularly the cervix, erosions and a certain amount of sclerosis may result.

A modified form of vaginal hysterotomy can also be utilised in those cases where a hard rigid cervix does not yield during the course of labour, and where it is necessary to deliver the child on account of foetal distress. The alternative to a vaginal Cæsarean section is to incise the cervical canal and then dilate it before delivery is effected. Incisions into the cervix for this purpose must be made at different places, so that, should the incised wound extend in the process of delivery, two dangers may be avoided—injury to the uterine vessels or the bladder, and opening up of the peritoneal pouch or the pelvic cellular tissue. This is best done by making a triradiate incision of the cervix, the incisions being generally done in a longitudinal direction at 10, 2 and 6 of the clock with reference to the cervical orifice. After delivery, in such cases, the margins of

the wound should be accurately brought into apposition with catgut sutures. The cervix should then be painted with some antiseptic such as brilliant green, mercurochrome, tincture of iodoform, etc.

CHAPTER XIX

ENLARGEMENT OF THE PELVIC CAVITY

We have described the methods of delivery by the abdominal route where there is a definite disproportion between the maternal pelvis and the fetal head, so that it would be impossible for a living

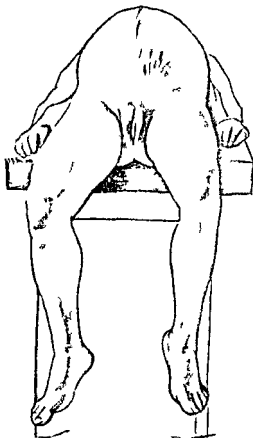


FIG. 10—Walcher's position

fetus to come through the particular pelvis. In suitable cases of relative disproportion it is possible for the head to come through provided the true pelvis is slightly enlarged, the enlargement being needed sometimes at the brim, sometimes at the outlet and sometimes throughout the cavity.

There are two methods by which enlargement of the pelvic canal can be obtained —

- (1) Postural methods, and
- (2) Operative methods

Postural Methods. Reference has been made in previous chapters to the possibility of increasing the dimensions of the pelvis in certain of its planes by placing the patient in a suitable posture. The two chief ones recognised for this purpose are Walcher's position and the exaggerated lithotomy position.

Walcher's position enlarges the conjugate vera, while the exaggerated lithotomy position increases the diameters of the bony outlet, particularly the anteroposterior diameter. The details regarding these postures, and the indications for their use, have been dealt with in the chapter on contracted pelvis.

Operative Methods of enlarging the Pelvic Cavity. The two well recognised methods of enlarging the pelvic cavity are the operations of symphysiotomy and pubiotomy or hebosteotomy.

Symphysiotomy

This operation, which was first performed in 1777, has had a very chequered career, being alternately condemned and praised as a suitable method of treatment for enlarging the pelvis and delivering the child in certain cases of relative disproportion. On the whole, there is very little support given to an operation of this description at present. The complications that are likely to occur during the course of the operation, the possibilities of damage to the urethra and the bladder, and the hæmorrhage that may occasionally be very troublesome to control if some of the veins are injured, and the relatively weak pelvic girdle that is likely to result thereafter, are some of the objections to the performance of this operation.

Pubiotomy, on the other hand, is a safer operation, provided care is taken in the selection of the cases. The chances of injury to the bladder and the urethra are much less, and the union is more firm than in cases of symphysiotomy.

Indications. The indications for either of these operations are —

- (1) Moderate degrees of contraction of the pelvic inlet or of the pelvic outlet.
- (2) Relative disproportion of the head to the pelvis because of an unduly ossified or large postmature head.
- (3) Unfavourable positions of the head, particularly occipito-posterior positions.

It must be clearly realised that pubiotomy or symphysiotomy is not to be adopted unless the obstetrician feels perfectly sure that

after such an operation the relative disproportion will be overcome and that the head can be born fairly easily through the enlarged pelvis. Secondly, the degree of enlargement should be strictly controlled so as to prevent subluxation of the joints or flaring out of the iliac bones. It must be clearly realised therefore that the enlargement of the pelvic diameters is possible strictly within certain limits. The cut ends should not be allowed to separate more than 6 cm. This is reckoned to give an increase of 1 cm. in the conjugate of the brim, 1.5 cm. in the oblique diameter and 2 cm. in the transverse diameter.

Necessary Conditions for performing Symphysiotomy or Pubiotomy There are certain conditions which must be fulfilled before either of these operations is undertaken —

- (1) The child must be alive
- (2) It should be a cephalic presentation but it is inadvisable to perform the operation in cases of brow presentation or persistent mento posterior positions
- (3) The cervix should be fully dilated
- (4) The pelvis must not be very much contracted and the extent of the disproportion between the foetal head and the pelvis should be moderate so that the slight increase in the pelvic diameter will allow the head to pass through
- (5) The parturient canal should not be infected
- (6) The membranes should have ruptured
- (7) Lastly, an attempt at forceps delivery should have preceded an operation of this nature

The first condition requires an explanation. It is within the experience of most obstetricians that occasionally one meets cases which appear as if they would present considerable difficulty at delivery, but when forceps is applied the head comes through easily. We do not consider it desirable that pubiotomy should be performed before traction has been attempted with forceps but of course only moderate force should have been used at such an attempt. Besides the fact that the child may be delivered in this way there is the additional advantage that it helps the obstetrician to a clearer realisation of the extent of the disproportion and the possibilities of the head coming through after enlargement of the pelvic cavity by either of these operations. Each necessary condition is dealt with in detail.

(1) *The Child must be alive* This is an important and obvious condition before undertaking an operation of this nature. There is absolutely no justification for submitting a woman to the risks of pubiotomy or symphysiotomy when the child is dead or when its condition is such that the chances of its being born alive or continuing to live after birth are small. If therefore in a case of prolonged labour it is found that the condition of the child is such that its

vitality is already very much impaired, the risks of the operation for the mother are such that, if forceps fail, a craniotomy should be carried out

(2) *The Child must present by the Cephalic Pole* This condition is necessary because it is only in such cases that the obstetrician can correctly judge whether the enlargement of the pelvis after symphysiotomy or pubiotomy will be sufficient to permit of the subsequent delivery of the foetal head. It is impossible to arrive at such a conclusion in breech deliveries. It is not, however, the most suitable method of treatment for cases of brow presentation or in mento posterior cases. In either of these cases, if the presentation cannot be corrected, the possibilities are that if after pubiotomy the head is pulled through as a brow or a mento posterior, the longest diameter that has to come through would put such a strain upon the relaxed pelvis that a much further amount of stretching would be necessary than is safe.

A suggestion has been made that in some cases pubiotomy may be performed to aid delivery of the after coming head. For this reason the pubiotomy needle must be passed and a Gigli wire saw kept in position so that the bone may be sawn through whenever difficulty is experienced in the delivery of the after-coming head. In practice however, this is not feasible, and in the hurry and excitement of delivering the after coming head there is risk of increasing the pelvic capacity to a dangerous extent.

(3) *Degree of Contraction of the Pelvis* This is a most important consideration to be borne in mind before attempting pubiotomy or symphysiotomy. As has already been emphasised, these operations are only to be performed within certain limits of pelvic disproportion. The most important point to note is the relative disproportion between the cephalic pole and the pelvis, and neither of these operations should be performed if the disproportion is at all great. It is difficult to lay down with any certainty the dimensions or the particular limits which may permit of a symphysiotomy or a pubiotomy. Such a decision can be arrived at only when the woman has been in labour for some time and the obstetrician has had an opportunity of appreciating the extent to which the cephalic pole overlaps. For this reason we are frankly opposed to what has been termed prophylactic pubiotomy—an operation which it is suggested should be performed a few weeks before the woman actually goes into labour. We have already stated that not only should these operations be done after the woman has been in labour for some time, but after an attempt at delivery with forceps. It is only by adopting such precautions that one will avoid the unnecessary employment of these operations.

(4) *The Cervix should be fully dilated* This necessarily follows from what has been stated above. There is no object in sub-

putting a woman to symphysiotomy or pubiotomy unless the conditions are favourable for an immediate forceps delivery and moreover if an attempt at forceps is to precede this operation it is obvious that the conditions necessary for the application of forceps should have been available one of the chief of which is that the cervical canal be fully dilated

(c) *The Birth Canal should not be infected* This is an important factor to be taken into account Whatever may be the precautions taken both in pubiotomy and symphysiotomy a certain amount of pelvic cellular tissue is opened up and the possibilities of spread of infection are accordingly much greater and maternal risks considerably increased If there is obvious sepsis or the woman has been frequently examined and repeated attempts made at delivery the case is most unsuitable for delivery by pubiotomy or symphysiotomy

Technique Having satisfied oneself that the necessary indications and conditions are present for the performance of this operation the patient is anaesthetised after the parts have been shaved and thoroughly cleansed She is brought to the edge of the bed and the legs supported by assistants as for a forceps delivery The area of the operation is painted with suitable antiseptic and draped with sterilised sheets

There are two methods by which the operation can be performed One is called the subcutaneous method and the other the open method The open method has been given up in view of the increased risks of septic infection In the subcutaneous method the skin of the anterior abdominal wall an inch and a half above the symphysis pubis is drawn down so as to lie over the symphysis A small transverse incision is made about half an inch in length and the blade of the knife passed through this incised wound its flat surface being closely applied to the anterior surface of the symphysis The knife is then turned at right angles and with the cutting edge the symphysis pubis is gradually cut through With a finger inserted in the vagina this can be controlled so that only the joint and the sub pubic ligament are divided Before final separation of the symphysis pubis care must be taken to see that the assistant on either side holds the thigh pressed inwards thereby preventing sudden flaring out of the iliac bones as the two pelvic bones spring apart After division of the symphysis pubis the knife is removed and the child extracted by forceps

A great deal of controversy has arisen as to whether at this stage it is desirable to leave all our to natural efforts but in view of what we have said already—that an attempt at forceps extraction should always precede this operation and only where this just fails to effect the delivery should symphysiotomy be performed—we hold that the forceps should be *in situ* before symphysiotomy is performed It

vitality is already very much impaired the risks of the operation for the mother are such that if forceps fail a craniotomy should be carried out

(2) *The Child must present by the Cephalic Pole* This condition is necessary because it is only in such cases that the obstetrician can correctly judge whether the enlargement of the pelvis after symphysiotomy or pubiotomy will be sufficient to permit of the subsequent delivery of the foetal head. It is impossible to arrive at such a conclusion in breech deliveries. It is not however the most suitable method of treatment for cases of brow presentation or in mento posterior cases. In either of these cases if the presentation cannot be corrected the possibilities are that if after pubiotomy the head is pulled through as a brow or a mento posterior, the longest diameter that has to come through would put such a strain upon the relaxed pelvis that a much further amount of stretching would be necessary than is safe.

A suggestion has been made that in some cases pubiotomy may be performed to aid delivery of the after coming head. For this reason the pubiotomy needle must be passed and a Gigli wire saw kept in position so that the bone may be sawn through whenever difficulty is experienced in the delivery of the after coming head. In practice however this is not feasible and in the hurry and excitement of delivering the after coming head there is risk of increasing the pelvic capacity to a dangerous extent.

(3) *Degree of Contraction of the Pelvis* This is a most important consideration to be borne in mind before attempting pubiotomy or symphysiotomy. As has already been emphasised these operations are only to be performed within certain limits of pelvic disproportion. The most important point to note is the relative disproportion between the cephalic pole and the pelvis and neither of these operations should be performed if the disproportion is at all great. It is difficult to lay down with any certainty the dimensions or the particular limits which may permit of a symphysiotomy or a pubiotomy. Such a decision can be arrived at only when the woman has been in labour for some time and the obstetrician has had an opportunity of appreciating the extent to which the cephalic pole overlaps. For this reason we are frankly opposed to what has been termed prophylactic pubiotomy—an operation which it is suggested should be performed a few weeks before the woman actually goes into labour. We have already stated that not only should these operations be done after the woman has been in labour for some time but after an attempt at delivery with forceps. It is only by adopting such precautions that one will avoid the unnecessary employment of these operations.

(4) *The Cervix should be fully dilated* This necessarily follows from what has been stated above. There is no object in sub

mitting a woman to symphysiotomy or pubiotomy unless the conditions are favourable for an immediate forceps delivery, and, moreover if an attempt at forceps is to precede this operation it is obvious that the conditions necessary for the application of forceps should have been available one of the chief of which is that the cervical canal be fully dilated

(5) *The Birth Canal should not be infected* This is an important factor to be taken into account Whatever may be the precautions taken both in pubiotomy and symphysiotomy a certain amount of pelvic cellular tissue is opened up and the possibilities of spread of infection are accordingly much greater and maternal risks considerably increased If there is obvious sepsis or the woman has been frequently examined and repeated attempts made at delivery the case is most unsuitable for delivery by pubiotomy or symphysiotomy

Technique Having satisfied oneself that the necessary indications and conditions are present for the performance of this operation the patient is anaesthetised after the parts have been shaved and thoroughly cleansed She is brought to the edge of the bed and the legs supported by assistants as for a forceps delivery The area of the operation is painted with suitable antiseptic and draped with sterilised sheets

There are two methods by which the operation can be performed One is called the subcutaneous method and the other the open method The open method has been given up in view of the increased risks of septic infection In the subcutaneous method the skin of the anterior abdominal wall an inch and a half above the symphysis pubis is drawn down so as to lie over the symphysis A small transverse incision is made about half an inch in length and the blade of the knife passed through this incised wound its flat surface being closely applied to the anterior surface of the symphysis The knife is then turned at right angles and with the cutting edge the symphysis pubis is gradually cut through With a finger inserted in the vagina this can be controlled so that only the joint and the sub pubic ligament are divided Before final separation of the symphysis pubis care must be taken to see that the assistant on either side holds the thigh pressed inwards thereby preventing sudden flaring out of the iliac bones as the two pelvic bones spring apart After division of the symphysis pubis the knife is removed and the child extracted by forceps

A great deal of controversy has arisen as to whether at this stage it is desirable to leave labour to natural efforts but in view of what we have said already—that an attempt at forceps extraction should always precede this operation and only where this just fails to effect the delivery should symphysiotomy be performed—we hold that the forceps should be *in situ* before symphysiotomy is performed. It

therefore follows that as soon as symphysiotomy has been performed the child is delivered by extraction by the forceps that has already been applied. Care should be taken during this delivery to exert as little force as possible. Any attempt at rapid delivery will cause a sudden increase of the extent to which the symphysis pubis is separated.

After the symphysiotomy has been performed and the blade of the knife removed it will be found that the point of puncture of the knife is much above the symphysis pubis and so possibilities of septic infection are lessened. The incision can be closed by a single suture of silk worm gut and dressed.

When the delivery has been completed and the placenta expressed the pelvis must be firmly strapped with a long strip of plaster about three inches wide passing round the pelvis at the level of the femoral trochanters. The patient should be kept on a firm bed with fracture boards under the mattress and treated much on the same lines as a fracture of the pelvis being allowed to move about only after two weeks.

The after care of the patient needs much careful attention.

The *dangers* of symphysiotomy are —

(1) Severe hæmorrhage from laceration of the structures behind the symphysis pubis especially when these involve the veins of the space of Retzius.

(2) Injuries to the urethra and bladder.

(3) Injury to the sacro iliac joints leading later to a permanent defect in locomotion.

(4) Infection of the wound.

Such injuries are more likely to result when the case is not suitably selected and the operation done when the head is relatively too big to come through easily after the pelvic diameters have been enlarged.

Excessive separation of the symphysis to allow of the foetal head to come through stretches the soft parts separates them and leads to irregular tears which may involve the soft structures especially the bladder and the urethra. In such cases apart from the shock the hæmorrhage is severe and the chances of septic infection are considerably increased. For this reason it is necessary that the assistants should understand the extent to which the pelvis must be supported after the symphysiotomy and during delivery of the head.

Most obstetricians prefer the much safer operation of pubiotomy when there is a necessity for delivery of the foetus through the natural passages in minor degrees of contracted pelvis or relative disproportion.

Pubiotomy

The indications for this operation as well as the conditions that should be satisfied before it can be undertaken have been dealt with under *symphysiotomy*

Pubiotomy has certain advantages over symphysiotomy and is therefore preferred when enlargement of the pelvic cavity is considered the best method of effecting delivery in border line cases of disproportion. These advantages are —

(1) There is less risk of injury to the bladder and the urethra

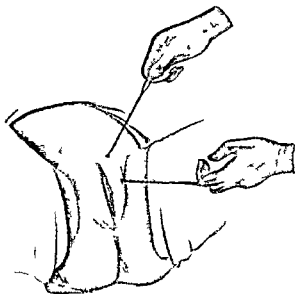


FIG. 211 — Pubiotomy. Gill's saw used.

(2) The hemorrhage is much less than in symphysiotomy because the bone is cut through further away from the median line and the veins in the space of Retzius are avoided

(3) The subsequent union is more firm and therefore a more stable pelvic girdle results

(4) A permanent enlargement of the pelvic canal is obtained

Technique There are two methods of performing pubiotomy the open method and the subcutaneous method. The open method has been largely given up now in view of the risks of septic infection. In the subcutaneous method after the patient has been prepared in the usual manner and anesthetised she is kept in the lithotomy position in the posture already adopted for the previously attempted forceps delivery. Two assistants one on either side hold the legs. A small transverse incision about an inch long is made generally over the left pubic tubercle down to the periosteum. A finger is then

passed through this incision and the adjacent tissues are separated from the bone. A Doderline's pubiotomy needle is now passed through the incised opening closely hugging the posterior aspect of the pubic bone, till the tip of the needle passes below the inferior margin of the bone. It is then manipulated so that the tip is felt lying deep to the upper and outer part of the labium majus. After making a small skin incision over the point of the needle it is made to protrude. Gigh's wire saw is then attached to the hook on the end of this and the needle withdrawn, so that the saw is brought out through the upper incision. Handles are then fixed to either end of the saw and the pubic bone is sawn through, care being taken to see that the whole of the bone is sawn through in the proper direction. At this stage the assistants must press the thighs inwards sufficiently to prevent undue separation of the divided pubic bone. After pubiotomy has been completed labour should be terminated by the forceps.

After delivery the upper wound may be closed with one or two sutures and sterile dressings are then applied over both the upper wound and that in the labium majus. The pelvis is immobilised by strapping with adhesive plaster and the patient kept at rest on a fairly hard and unyielding mattress.

The after-care is similar to that in any ordinary puerperium.

Prognosis. Pubiotomy not only allows delivery of the foetus at the time but increases the dimensions of the pelvis permanently, so that at subsequent labours the child may be born *per via naturalis* more easily. The immediate risks of the operation have already been dealt with. If suitable cases are selected and the technique carefully followed the prognosis should be favourable. Misjudgment as to the relative degree of disproportion, injury to some of the important structures and sepsis militate against a successful outcome.

Indications The indications for this operation must be clearly defined and it is advisable in every case where abortion is to be induced that the practitioner protects himself from the charge of unjustifiable interference by conscientiously considering all the factors indicating the necessity for induction as well as by obtaining a second and independent medical opinion in writing. With a clearer realisation of the possibilities of conservative treatment of that pregnancy may continue the indications for induction of abortion are gradually becoming more and more limited. Obviously this is an operation which is performed in the interests of the mother when conditions are present which will lead inevitably to a fatal issue or to serious impairment of the health if pregnancy be allowed to continue.

The main indications are —

(1) To save the mother from the immediate risk of a serious complication of pregnancy

(2) To prevent serious risk to life or health if pregnancy be allowed to continue

(3) To prevent the possibility of certain complications supervening should pregnancy continue

(1) *To save the Mother from Imminent Risks*

(a) In cases of hyperemesis gravidarum. This is a serious complication which occasionally can only be controlled by evacuation of the uterus. Care must be taken to see that the patient is not *in extremis* before such an operation is undertaken.

(b) In some cases of incarceration of the retroverted gravid uterus.

(c) Acute yellow atrophy

(2) *To prevent Unnecessary Risk to the Mother* The following conditions may be mentioned under this group —

(a) Pre eclamptic toxæmia

(b) Diseases of the heart if decompensation has occurred at some time

(c) Certain cases of tuberculosis of the lungs

(d) Chorea gravidarum

(e) Hydatiform mole

(f) Certain general diseases which may seriously impair the health of the mother such as nephritis, leukæmias, exophthalmic goitre, certain nervous diseases, etc.

(g) Intractable pyelitis

(3) Under the third heading may be mentioned such conditions as tumours complicating pregnancy, malignant disease of the cervix, etc.

METHODS OF INDUCING ABORTION

Certain considerations must be borne in mind in the choice of the particular method of inducing abortion

(1) **The Duration of Pregnancy** Within the first twelve weeks of pregnancy it is possible to induce abortion and complete the evacuation at one sitting by operative methods through the vaginal route. After the twelfth week on the other hand this procedure becomes increasingly difficult and after the sixteenth week it is neither possible nor desirable to attempt to complete the evacuation at one sitting. Under such circumstances if the evacuation is urgent a different method has to be followed.

(2) The method also depends upon the urgency of the case. As has been pointed out rapid methods of evacuation are not possible if pregnancy has progressed beyond the twelfth or fourteenth week.

(3) In certain circumstances as in primiparae and also when a hard rigid cervix is met with the method of inducing abortion may be different from that ordinarily followed in a multipara and with soft yielding cervix.

We shall now proceed with the different methods of inducing abortion —

- (1) Dilatation of the cervical canal with evacuation of the uterus by the finger or the curette
- (2) Gradual dilatation of the cervical canal by the use of laminaria tents
- (3) Dilatation of the cervical canal by plugging of the canal and the vagina with gauze
- (4) Vaginal hysterotomy
- (5) Abdominal hysterotomy
- (6) The use of Roentgen rays

(1) **Dilatation of the Cervical Canal with Evacuation of the Uterus by the Finger or the Curette** This method of evacuation may be adopted before the twelfth week of pregnancy in suitable cases. The patient is anaesthetised and prepared with all due aseptic and antiseptic precautions. the cervix is dilated by Hegars or Matthews Duncan's dilators sufficiently to admit the finger freely. The finger is then introduced through the cervical canal and the ovum is gently separated from the uterus. After separation of the ovum an ovum forceps is passed into the uterus the ovum grasped and removed by gentle twisting and traction. The ordinary ovum forceps is however often too big to be introduced with the dilatation that has been effected and we have found the ordinary sponge forceps quite as effective to grasp and remove the ovum. After this has been removed a blunt flushing curette may be introduced into the uterus and the uterus gently curetted and flushed out. It is

always necessary to verify by passing the finger again into the uterine cavity to see if all the products of conception have been completely removed. This precaution is advisable as not infrequently the use of the curette leaves behind bits of placenta which keep up bleeding and later decompose and give rise to sepsis.

(2) **Gradual Dilatation of the Cervical Canal by Laminaria Tents** In this method the cervix is dilated up to No. 12 size of Matthews Duncan's dilator and one or two laminaria tents properly sterilised are introduced into the cervical canal so that their tip lie beyond the internal os, and left *in situ* for twelve to twenty-four hours. The cervix is gradually dilated as the tents swell by absorbing moisture, uterine contractions are provoked and at the end of the period the tents are removed and the uterus evacuated in the manner already described above as after twenty-four hours cervical dilatation permits the introduction of one finger.

The disadvantage in this method however is that it is not always possible to avoid sepsis. We ourselves do not advocate the use of laminaria tents for the induction of abortion.

(4) **Vaginal Hysterotomy** This is a method of evacuation which is rapid and certain. In some cases as in primiparæ with a hard rigid cervix, or in certain diseased conditions where it is not desirable to prolong any operation and particularly if the period of amenorrhœa extends beyond the fourteenth week it is not possible to dilate the cervix sufficiently to complete the evacuation at one sitting. A vaginal hysterotomy is then indicated.

This operation is done in much the same manner as a vaginal Cæsarean section and the technique of the operation has been dealt with in that chapter.

(5) **Abdominal Hysterotomy** This method of evacuation in the second trimester of pregnancy is becoming more and more popular and deservedly so. The technique may be described as that of a miniature Cæsarean section. It can be done in many cases where a rapid method of evacuation unattended with shock, is necessary. Secondly, one of the chief advantages of this method is that there is no possibility of sepsis provided the case has not been previously infected nor is there any risk of cervical lacerations, attended with shock hæmorrhage and possible introduction of septic infection. A third and a distinct advantage is that this operation can be combined with that of sterilisation of the patient—a procedure necessary in certain cases where it is undertaken for grave complications such as heart disease tubercular infection of the lung, etc. We have resorted to this operation frequently and particularly in cases of hydatidiform mole, where it undoubtedly presents very many advantages over the vaginal method of evacuation. It can be done at one sitting when all the vesicular contents can be freely evacuated, and an advantage which is apparent, when

the operation is done is that one can see the uterine musculature and decide whether the chorionic villi have already invaded it or not. This will help the obstetrician to decide whether in view of the malignancy or the potential malignancy of the case the question of hysterectomy may also have to be faced.

The *technique* of this operation is exactly similar to that of a Cæsarean section. An incision is made in the upper uterine segment the uterus opened into the contents evacuated and the uterus closed with sutures which do not involve the endometrium. In cases where sterilisation has to be done two courses are open —

(a) To perform a supravaginal hysterectomy. A supravaginal hysterectomy even with retention of the ovaries produces an artificial menopause which is not always desirable in young women.

(b) By the exclusion of both Fallopian tubes. This can be effectively done in one of two ways — by removing the whole of the Fallopian tube up to the uterine end and invaginating that end in the uterine musculature or by resecting a portion of each Fallopian tube and invaginating the cut ends between the layers of the broad ligament.

The latter alternative permits of the possibility should the occasion arise or the patient desire it at a later date of freeing the medial cut ends of the Fallopian tubes and re-establishing patency so as to allow of a possible pregnancy occurring.

(6) **Exposure to the Roentgen Rays** This is a method that has been advocated for promoting abortion. It is not quite clear whether the abortion if it does occur by such exposures may not be followed by other consequences. The ovaries must be simultaneously affected by the Roentgen rays and further should a subsequent pregnancy arise one is not quite sure if the pregnancy will develop along physiological lines. The method is not one that is free from risks and cannot be said to have any advantage over some of the other methods already described.

Prognosis The prognosis in therapeutic abortion depends upon the particular condition which necessitated the abortion as well as the procedure adopted for this purpose. It is not possible to give any definite prognosis so far as the underlying factor that necessitated the abortion is concerned but with regard to the prognosis for the actual operation there should be little or no risk provided care is taken in the choice of the operation and the correct technique adopted. In certain cases vaginal or abdominal hysterotomy would offer a much better outlook than the methods of forcible dilatation for the reasons already emphasised.

Induction of Labour

Labour may be induced at two stages (1) before the woman has reached term or (2) at term or after term. In the former case we speak of induction of premature labour and in the latter where the woman has already reached term or is possibly past the term we speak of induction of labour.

The indications for the two operations are obviously different.

Indications for the Induction of Premature Labour This operation is done only after the child is viable but inasmuch as the viability of the child does not synchronise with the possibilities of its survival after birth few will attempt to induce premature labour with the hope of getting a live child capable of survival before the thirty-fourth week of pregnancy.

It is done largely in the interests of the mother and occasionally in the interests of the child. The chief indications are —

- (1) Contracted pelvis
- (2) Pre-eclamptic toxæmia or chronic nephritis complicating pregnancy
- (3) Cardiac lesions
- (4) Tuberculosis pulmonum
- (5) Placenta prævia or accidental hæmorrhage
- (6) Chorea gravidarum
- (7) Hydramnios
- (8) Habitual death of the fœtus *in utero*
- (9) Excessive size of the child at previous deliveries
- (10) Certain cases of diabetes
- (11) Pyelitis or pyelonephritis complicating pregnancy
- (12) Certain rare cases of mental instability occurring during pregnancy

We shall take these indications *seriatim* and discuss the proper place of induction of premature labour in their treatment.

(1) *Contracted Pelvis* The place of induction of labour in the treatment of contracted pelvis has been described *in extenso* in the chapter on that subject. It is no doubt true that if labour is induced some weeks earlier in certain cases of contracted pelvis the child may be born through the natural passages either spontaneously or by the aid of minor operative procedures. But such a child is premature and it must be realised that it is born with certain handicaps which may make it difficult for it to survive the postnatal period. But the chief objection to this operation lies in the fact that at present there is no reliable method of judging how far induction of premature labour is necessary. The Munro Kerr Muller method and other methods that are often utilised for this purpose give only a rough idea of the possibilities of delivery through the natural

passages or of the degree of difficulty that may be experienced. Those who have had a large experience of test labour will realise what surprising results are obtained with cases at term which early in labour present an apparent degree of disproportion which causes anxiety to the obstetrician. The greater and more extended use of test labour followed if it fails by a lower segment Cesarean section would appear to have displaced induction of premature labour from the prominent position which it occupied as a method of treatment in cases of contracted pelves. It has been our experience that few cases have had to be treated by induction of premature labour. We very much prefer to wait till the woman is at term before deciding whether to allow test labour or alternatively to resort to a Cesarean section. We believe that by such means a larger number of children can be saved with no additional risk to the mother.

(2) *Pre-eclamptic Toxæmia or Chronic Nephritis* These offer an indication for induction of premature labour. When a patient has been treated for some time—ten to fourteen days—for pre-eclamptic toxæmia and is not responding and the risk of eclampsia developing is increasing or it is found that although the imminent risks of eclampsia have passed there is a persistent albuminuria the necessity for induction of labour should be seriously considered. It has been conclusively proved that in such cases if the pregnancy is allowed to continue permanent damage to the kidney is inevitable besides the possibilities of eclampsia supervening at any period subsequently. The ideal method of treating such cases would therefore be by induction of premature labour and in such cases it is not possible to take into serious consideration the interests of the child.

(3) *Cardiac Lesions* The indications and the condition under which induction of premature labour should be resorted to in certain cardiac lesions have been fully elaborated in the chapter dealing with heart diseases complicating pregnancy. We would however mention this fact—that induction of premature labour is not the proper line of treatment to adopt when one is dealing with a decompensated heart in a pregnant woman. On the other hand in those cases where the decompensation has been noted previously and the patient has responded to rest and if necessary digitalis the question whether pregnancy should be allowed to continue or whether in the interval when the condition of the patient is fairly satisfactory pregnancy may not be terminated is a serious matter to be decided by the obstetrician. In selected cases therefore induction of premature labour would appear to be justifiable in cardiac lesions.

(4) *Tuberculosis of the Lung* This was one of the conditions where formerly premature labour was more frequently resorted to. It would appear however that pregnancy as it advances has beneficial effects in this condition as the increasing size of the uterus presses on the diaphragm and produces a condition akin to artificial

pneumothorax This clinical observation, however, may be noted, that women with pulmonary tuberculosis, although they show a surprising amount of improvement in general health in the later months of pregnancy, unfortunately break down rapidly subsequent to confinement. It does not appear to be necessary, therefore to resort to induction of labour in such cases, except it be in the interests of the child when the woman is rapidly getting worse and the condition of the foetus is good.

(5) *Placenta Prævia or Accidental Hæmorrhage* The condition of placenta prævia is one associated with uncertainty as regards the possibility of hæmorrhage and the degree of hæmorrhage. We have realised that where a placenta prævia has been diagnosed, whether in a primigravida or multipara it is dangerous to allow the woman to continue, even in an institution, as a sudden hæmorrhage may occur at any time and produce a dangerous degree of collapse. Under such circumstances it would appear to be more rational to resort to termination of pregnancy, preferably by a Cæsarean section, if it be a central placenta prævia to avoid the risks incidental to both mother and child. In minor degrees rupture of the membranes may suffice.

In cases of accidental hæmorrhage, where bleeding is severe or is slight but persistent, evacuation of the uterus must be undertaken.

(6) *Chorea Gravidarum* In severe cases of chorea there is grave risk to the mother, and it is particularly desirable that premature delivery should be brought about. The condition should not be allowed to continue till it is too late, as the patient is not able to respond to treatment.

(7) *Hydramnios* The question of induction of premature labour for this condition will depend upon the extent of the hydramnios and the severity of the pressure symptoms. Where the patient is restless with dyspnoea and other pressure symptoms it is desirable to terminate pregnancy. An effective method is to puncture the membranes through the abdominal wall very much as when performing a paracentesis abdominis for ascites and in the course of twenty four hours the woman goes into labour and delivers herself with complete relief of symptoms and without the usual risk of shock, collapse, or postpartum hæmorrhage. The child may be premature, but the mother's condition is so miserable and the possibilities of survival of the foetus, often deformed so limited, that one is not justified in allowing pregnancy to continue for the sake of the foetus.

(8) *Habitual death of the foetus 'in utero'* is a somewhat rare condition, it is unassociated with any renal disease or specific infection. Where the history points to this occurring at a definite period of pregnancy, perhaps about the thirty-eighth week, it is justifiable to induce labour a week before that date with a view to saving the life of the foetus.

(9) *Excessive Size of the Fetus* We have noted in some cases that the mother bears excessively large children the weight of the child being over ten pounds and certainly if it is over twelve it presents problems in delivery which make it very risky for the child as well as for the mother. When such a history is obtained it is justifiable to induce premature labour at a suitable date.

(10) The question of whether induction of labour should sometimes be employed in cases of diabetes is difficult to decide. With the improved methods of treatment available for diabetes complicating pregnancy the prognosis of this complication in pregnancy has considerably improved, but there are cases where death of the foetus is likely to occur in the last weeks of pregnancy and labour should be induced in such cases. Also in diabetics an unduly large child is common and may form an indication for inducing labour prematurely.

(11) In *pyelitis* the pregnant uterus may be an actual impediment to free drainage through the ureters and in such circumstances it is better to induce premature labour and so to allow of the underlying condition being effectively treated. It is however rarely necessary in the majority of cases.

(12) Lastly in certain cases of *mental instability* which have not necessarily reached the stage of mania one has to consider the possibility of premature induction of labour with a view to relieve the further strain and stress on the mental condition resulting from the prolongation of pregnancy.

Indications for Induction of Labour at Term or after Term
Induction of labour at term or for postmaturity is undertaken for entirely different considerations. It is particularly indicated in cases where the increase in the size of the foetal head as well as the less efficient head moulding due to the harder cranium will constitute a difficulty at delivery. In a postmature child the degree of mouldability is considerably reduced. The child may also increase in size generally but the chief difficulty arises at the delivery of the head and the shoulders. It is unwise in the majority of cases to allow the woman to go much beyond the expected date of confinement and it is a safe rule to induce labour if the woman has passed the probable date of confinement by a week or a fortnight at the latest.

Prognosis With a more perfect technique and particularly with the medicinal methods of inducing labour the prognosis so far as the mother is concerned should be favourable. The chief risks are those incidental to infection.

So far as the child is concerned there is an added risk in the induction of premature labour which is directly proportional to the period of pregnancy at which induction is carried out. It also

depends upon other factors such as the particular pathological condition which necessitated the induction. A premature child passing through a narrowed pelvis is more likely to suffer intracranial hæmorrhage than a mature child. This fact has to be taken into account in deciding on the advisability of inducing labour in cases of contracted pelves. Further the presentation of the fœtus has also got a bearing on the prognosis. It is always desirable to convert a malpresentation into a cephalic presentation so as to judge of the possibilities of the head going through when labour is induced in cases of contracted pelves.

METHODS

Several methods are in use for induction of labour the chief of which are —

- (1) Rupture of membranes
- (2) Introduction of bougies
- (3) Dilatation of the cervical canal with metallic dilators or hydrostatic dilators
- (4) Medicinal methods

(1) Rupture of Membranes This is one of the oldest methods available for inducing labour. A sound or a suitable instrument is passed through the cervical canal and the membranes punctured. It is simple and can be done aseptically. For a long time this method was given up on the ground that drawing of the liquor amni was not always in the best interests of the fœtus. Recently however the method has been revived and we must confess that in suitable cases it appears to be a safe and a certain method *albeit* the duration of labour and the time of its onset may not always be accurately predicted. This method is chiefly employed in cases of hydramnios in the toxæmias of pregnancy in conditions like placenta prævia and accidental hæmorrhage. It is not desirable to attempt it in elderly primiparæ or in patients with a long and rigid cervix.

(2) The Introduction of Bougies This is also known as Krause's method of induction. It consists in passing two or more gum elastic bougies through the cervical canal into the uterine cavity between the membranes and the uterine wall. The bougies must be properly sterilised and they must be passed gently so as not to encroach upon the placental site. They are left in position for eight to forty-eight hours, by when the uterus should have begun to contract. They should not be removed till labour is well established. Indeed they may be left to be delivered with the placenta.

The risks incidental to this method are —

- (1) that occasionally the placenta may be separated giving rise to hæmorrhage and
- (2) that the risks of infection are greater as the bougies communicate with the outside

This method has been largely given up at present

(3) **Dilatation of the Cervical Canal** This is a time honoured method of inducing labour. The cervix is dilated by a few metal dilators such as Hegar's dilators and then one or other of the hydrostatic bags is introduced. We have already stated that we do not commend the use of laminaria tents for inducing abortion and the same holds good for the induction of premature labour. When the cervix is dilated sufficiently to admit two fingers the use of hydrostatic dilators may be considered. There are several of these but the most commonly used is Champetier de Ribes' bag.

The conditions under which this bag can be used have been elaborated in the chapter on placenta prævia.

We do not advocate the use of intra uterine injections such as glycerine or plugging of the vagina or cervix as methods of inducing labour. We consider that these practices should be entirely discarded as they are ineffective and attended with serious risks of sepsis.

Where immediate delivery is needed one can more safely resort to vaginal or abdominal Cæsarean section depending upon the particular circumstances connected with the case than any of the uncertain methods of inducing labour which carry with them the risks of sepsis lacerations of the cervix shock and hæmorrhage.

(4) **Medicinal Methods of Induction** This method is much more successful if the woman is at term or past the probable date of delivery. There are variations in the details of the medicinal methods employed but usually there is a combination of castor-oil quinine and pituitary extract. One routine adopted is that the woman is given a dose of castor-oil one ounce at 6 A.M. followed by a large soap and water enema at 8 A.M. and then by quinine 5 to 10 grains by mouth. If labour does not come on a small dose of pituitary extract is given two hours after and repeated at intervals, if necessary. In some cases labour comes on in others it does not come on for periods varying from forty-eight to seventy-two hours. Occasionally it may be necessary to repeat this course three or four days later. The question as to whether quinine or pituitary extract may occasionally bring about foetal death has been fully discussed in recent literature. The method of medicinal induction of labour which we have adopted for some time is slightly different. On the ground that quinine is a factor that may be responsible for the occasional death of the foetus we have discarded the use of this

drug altogether in the medicinal method. Our practice is to give the woman at 6 A.M. 1½ ounces of castor oil. 9 A.M. soap and water enema. 12 noon one sixth cc of pituitary extract and repeat this at intervals of three hours till the patient has had one half cc of pituitary extract in other words three doses. If labour does not begin within twenty four hours it is desirable to leave the woman alone for the time being and repeat the same procedure after three or four days. Rarely have we failed at the second attempt to induce labour.

We should emphasize the need for small doses of pituitary extract. It has been mentioned that pituitary extract may sometimes cause tonic contractions of the uterus and even rupture. But the small doses that have been suggested if given with due consideration of the condition of the uterus at the time of administration do not in our opinion carry any risk. Occasionally labour pains start and then pass off. In such cases we have combined the medicinal method with artificial rupture of the membranes—an almost certain method of inducing labour.

Accouchement forcé or forcible dilatation of the cervix followed by immediate delivery is an unfortunate expression which is still prevalent in obstetric literature. Whatever might have been the justification for this method of delivery at one time there is little scope for it now, in view of the more safe operative procedures that have been elaborated to meet such cases of emergency. A woman may require immediate delivery in certain rare cases but it is not justifiable to submit her to any forcible methods of cervical dilatation particularly by branched metallic dilators which cause serious lacerations and the possibility of disaster overtaking the obstetrician during the process of dilatation. We have for some years relegated these instruments to the obstetric museum and do not propose to use them again. Bossi's dilators. Frommer's dilators. De Signeux's dilators have all had their day and may take a well earned rest as memories of a bygone era!

SECTION VIII

PATHOLOGY OF THE PUERPERIUM

CHAPTER LI

PUERPERAL INFECTION

AFTER all well-conducted labours a physiological puerperium is anticipated. There should have been little or no damage to the patient at labour and except for minor disturbances such as after pains and the initial engorgement of the breasts there should be freedom from discomfort. The puerperium should be apyrexial, the pulse rate normal, the general condition should be as satisfactory as it was before the period of pregnancy and delivery, and in fact in the majority of cases the woman should not feel the strain of labour or of the puerperium.

Unfortunately this happy state of affairs does not always exist. Several complications may occur during the puerperium, the chief of which is septic infection.

The term *puerperal fever* was originally used to denote the morbid condition of the woman in the puerperium when the chief symptom was a rise in temperature. For long the nature of puerperal fever was not clearly realised and various theories were held which are now only of historical interest.

ÆTIOLOGY

Puerperal fever is the term commonly used to denote septic infection of the genital tract following full time labour or abortion. It differs in no way from surgical wound infections but in view of the peculiar nature of the parts exposed to invasion by the micro-organisms such as the large raw uterine surface with the widely open blood channels peculiarities are observed which perhaps may not be present in the ordinary surgical infections.

BACTERIOLOGY

A large number of organisms have been isolated from cases of puerperal infection. Among the chief of these are streptococci hæmolytic and non hæmolytic, staphylococci gonococci *bacillus coli communis* *bacillus aerogenes capsulatus* *bacillus diphtheriæ*,

bacillus typhosus *bacillus tetanus* pneumococcus and other forms of bacilli. The commonest of these micro organisms are the streptococci (hæmolytic and non hæmolytic) *bacillus coli* staphylococci and the gonococci.

Mode of Infection When one considers the problem of puerperal sepsis one is confronted with a strange experience which at first sight appears to be most contradictory and puzzling. It is the experience of most obstetricians that occasionally a case which was delivered spontaneously without a perineal laceration and without even one vaginal examination having been made develops a severe type of sepsis which may even prove fatal. On the other hand, a case which has had a very strenuous labour with an operative delivery not always carried out under ideal conditions or surroundings escapes infection and runs an apyrexial puerperium. More often where active interference has been necessitated the cases do show a certain amount of reaction fortunately mild in the large majority of cases. The question arises as to why such variations should occur in regard to infection. Unfortunately a bacteriological examination of the vaginal flora before and after delivery far from throwing any light on the subject has only made the position more complex and puzzling. When such a bacteriological investigation was carried on by us it was found that even in cases where aerobic and anaerobic hæmolytic and non hæmolytic streptococci were isolated from the vaginal smears before delivery the patient had an apyrexial puerperium. Again during the puerperium it has not been infrequent to isolate streptococci in cases where no evidence of clinical infection was manifest.

It would appear from a consideration of these observations that three primary factors have got to be borne in mind namely the soil the seed and the sower. By the soil we mean the natural resistance of the patient and the condition of the genitalia before and after delivery. The seed may here be represented by the micro organisms which are sown into the soil by a careless operator. The sower is the obstetrician or the midwife in charge of the case and to whom the ultimate responsibility of the delivery is entrusted. The mode of infection therefore can best be realised by a thorough appreciation of all these factors. If the vitality of the patient is lowered and if the genital tract is subjected to bruising or laceration and so the vitality of the genital tract brought below par the chances of micro organisms gaining a footing and thriving are definitely increased. Secondly the micro organisms themselves are most often introduced from outside and gain ready admission when circumstances are favourable. If care be taken their entry may be checked and their development arrested. There are many ways in which micro organisms can gain admission. A most elaborate technique may be adopted masks gloves sterilised

gowns sterilised towels, may all be used in the delivery of the patient but if in the actual manipulation scrupulous attention is not paid to the minutest details the chances of infection are not diminished. We have had time and again to warn the beginner against placing too much reliance on these preparations to the neglect of some of the essential factors concerned in the avoidance of sepsis. The close proximity of the rectum to the birth canal is one of those factors that must always be borne in mind. If the gloved hand sweeps over the perineum and incidentally touches the anus as not infrequently happens when the obstetrician is faced with a difficult situation no amount of protection given by the accessory precautions will prevent the spread of infection. We do not for a moment suggest that these accessories should be given up but our object is to emphasise the more important factors that is the technique of internal examination and the technique of operative procedure.

Auto infection By this term is meant the infection is of an endogenous nature that is to say, the organisms have remained latent somewhere in the genital tract and have flared up consequent upon some damage during delivery. Authentic cases are on record where auto infection has been responsible for puerperal sepsis. It is as well to limit the term auto infection to those rare cases where the bacteria have been lurking in the genital tract and have flared up and invaded the tissues after delivery. Occasionally gonococci streptococci and *bacilli coli communis* may be present in the generative tract, and in the presence of lacerations or due to the lowered vitality of the patient may increase in virulence and cause a severe attack of sepsis. It should be clearly realised that in the majority of cases the infection is exogenous and not endogenous unless therefore overwhelming evidence is available to exclude the possibility of exogenous infection it is a grave mistake for the obstetrician to console himself with the idea that auto infection has been the cause of puerperal infection. In the majority of cases such infection is due to the physician or the midwife concerned in the delivery. There are several recorded cases occurring in epidemic form when from a focus of infection in the obstetrician or midwife a general puerperal infection has occurred in a series of cases.

A source of infection to which a great deal of attention has been drawn recently is the droplet infection generally due to an acute rhinitis pharyngitis or tonsillitis. Obstetricians or midwives who suffer from any such infective conditions should abstain from attending cases of delivery till they are free from the possibilities of acting as carriers of infection. Such droplet infection would appear to be much more frequent in colder countries than in the tropics and perhaps the close atmosphere with lack of free

perflation of air, under which these deliveries have to be conducted in particular seasons of the year, may account for the greater predominance of cases of droplet infection in such countries than in the tropics. The surroundings in which the patient has to be delivered have also an obvious bearing upon the occurrence of puerperal infection. Dirt and dust, effluvia from an underground sewerage, etc., are all factors to be borne in mind. In tropical countries the danger is increased owing to the unfortunate practice that is prevalent in large areas of attendance by untrained midwives with no knowledge of asepsis whose first inclination is to make an internal examination when the woman is said to be in labour. Side by side with this serious risk ought to be remembered the possibility of a self examination by the patient. The use of dirty linen, coitus during the later weeks of pregnancy and generally the insanitary habits of life may all influence the possibilities of sepsis.

Other factors to be taken into consideration are the following —

(1) *Age and Parity* The possibilities of infection are greater in elderly primipare and this may be due to a greater risk of trauma resulting during child birth.

(2) *Duration of Labour* This has a bearing upon the possibility of infection, and in cases of prolonged labour it may be stated that the risks are definitely greater, particularly if the membranes have been ruptured for a long number of hours.

(3) *Assisted Labour* The chances of infection in such cases are definitely greater than in normal labour. Much will depend upon the nature of the assistance and the stage at which this was required. Manual removal of placenta intra uterine manipulations, modes of delivery resulting in laceration of tissue and hæmorrhage after labour are all factors which will increase the incidence of sepsis.

(4) *Associated Conditions* There are a number of associated factors which, by lowering the vitality of the patient, increase the possibilities of infection. Among these may be mentioned anæmia, wasting diseases, diarrhoea, dysentery, antepartum hæmorrhage, toxæmias of pregnancy, particularly albuminuria and eclampsia, and possibly certain endocrine deficiencies. Among the conditions that may lower the local resistance of tissues in the genital tract may be mentioned lacerations and bruising of the soft parts, particularly tears of the cervix, retention of portions of membrane or placenta or blood clots, etc. It has been shown that deficiency of vitamin A, the anti-infective vitamin, is a factor to be taken into consideration in the causation of puerperal sepsis.

MODE OF SPREAD OF INFECTION

When the micro-organisms have gained admission into the birth canal they may develop in a localised area and their toxins are absorbed into the blood stream. The organisms may thrive in

the placental site in the cervix vagina or perineum and if lacerations be present in any of these areas they may give rise to what are known as 'puerperal ulcers'. Such organisms are generally the pyogenic organisms and by destruction of the tissues they cause sloughing of the parts and discharge a large quantity of putrefying material.

On the other hand some organisms after gaining admission at any of these sites may enter the deeper structures—the uterine musculature—and then spread by one of three channels

- (1) by the lymphatic stream,
- (2) through the blood vessels
- (3) by contiguity of the tissues

In these cases not only do the toxins find their way into the general circulation but the micro organisms themselves are disseminated when they invade the lymphatic or blood vessels and may get deposited in various situations giving rise to manifestations of a generalised infection with the development of secondary foci of infection. Where the infection spreads by contiguity of tissues, it may start with infection of the vulva as a vulvitis spread to the vagina as a vaginitis and thence upwards as a cervicitis or endometritis and later it may involve the Fallopian tubes resulting in a salpingitis or the ovary giving rise to an oöphoritis. The spread may also be into the pelvic cellular tissue giving rise to parametritis and later the pelvic peritoneum may be involved giving rise to perimetritis. If the infection spreads further, a general peritonitis may result. More commonly however the infection spreads through the lymph stream or the blood stream giving rise to a pelvic cellulitis or peritonitis and infection of the tubes and ovaries. In some cases a diffuse thrombophlebitis may be set up in the pelvis. Not infrequently all the three types of spread of infection may be present in the same case.

When the micro organisms enter the blood stream the result may be either a septicæmia or a pyæmia. This depends upon the nature of the organism, generally pyogenic organisms when they gain admission into the blood stream are more likely to cause a pyæmic infection with foci of infection in different parts of the body. When micro-organisms enter the blood stream the condition is sometimes known as 'bacteriæmia'.

PATHOLOGY

The pathological lesions that may be found in cases of puerperal infection vary with the nature and severity of the infection and with the particular part of the genital tract affected. The lesions may be found in the vulva vagina cervix uterus Fallopian tubes

ovaries, the pelvic cellular tissue, pelvic peritoneum general peritoneum and in other parts of the body when a generalised infection occurs as in cases of bacteriæmia.

Lesions of the vulva and vagina are not infrequent particularly at operative deliveries. The tears that result may become infected and later ulcerate. The term puerperal ulcer was given to this condition but with improved methods of delivery such ulcers should be rare. A certain amount of toxic absorption may result from these ulcers but the greater danger is the possibility of an upward spread of the infection. In severe cases where labour has been prolonged and the presenting part has been jammed in the pelvic cavity the pressure necrosis resulting therefrom may cause sloughing of large areas. If such sloughs are formed in the anterior or posterior vaginal walls they tend to separate in the first week of the puerperium, and if they are deep sloughs they may result in the formation of fistulous openings between the bladder and the vagina or between the vagina and the rectum. In cases where extensive damage has been done to the vagina after the separation of the sloughs the ulcers tend to heal but severe cicatricial contractions may result, almost occluding the whole of the vaginal cavity, so that the insertion of even one finger is rendered difficult. Lacerations of the perineum may also tend to cicatrize irregularly.

Cervix Lacerations of the cervix are not infrequent especially when delivery is effected before full dilatation of the cervix. Cervical lacerations when they become infected may slough and the infection may easily spread to the endometrium and parametrium.

Uterus The most common lesion in cases of puerperal infection is acute endometritis. The uterine cavity immediately after delivery presents a large raw surface with sinuses which are occluded by large thrombi. If infection spreads to the uterine cavity micro organisms can thrive very easily on the raw area and on the thrombi the result being that the whole of the endometrium may be involved in the inflammatory process and may tend to slough. When infection is due to virulent organisms such as streptococci it may not be limited to the endometrium but the organisms may spread into the musculature of the uterus and then reach the blood stream or the lymphatics. When however, the infection is limited to the endometrium a condition spoken of as *putrid endometritis* results, wherein will be found a thick layer of necrotic material which lines the uterine cavity and in which are embedded large numbers of the causative micro organisms. Behind this thick necrotic layer will be found a layer of leucocytic infiltration known as the 'zone of reaction,' the activity of which varies with the virulence of the organisms and the extent to which they are limited to the necrotic area by the patient's powers of resistance. Beyond

this zone of leucocytic infiltration is a zone of more or less normal tissue perhaps slightly congested and infiltrated with inflammatory cells. Where the organisms are more virulent the endometrium may not show a definite necrotic area and the organisms are found throughout the thickness of the uterine musculature the zone of leucocytic infiltration being absent or very imperfectly developed.

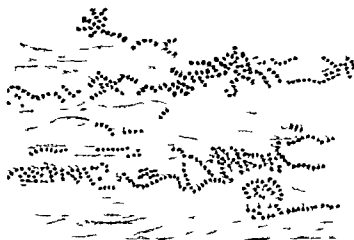


FIG. 1.—Puerperal sepsis streptococcal invasion of the uterine musculature

Salpingitis The infection spreads to the Fallopian tubes by one of three ways

- (1) by contiguity of tissues through the uterine end of the Fallopian tube,
- (2) by spread through the pelvic cellular tissue or peritoneal tissue,
- (3) by the lymphatics

When infection of the tubes occurs by spread through the uterus the infection is generally bilateral. The result of such infection depends upon the micro-organisms responsible. When pyogenic organisms gain admission the lining membrane of the Fallopian tube is damaged the fimbrial extremity becomes inflamed and later occluded and the tubal wall becomes thickened while a purulent exudate distends the tube converting it into a pyosalpinx. If however more virulent organisms gain admission other changes may take place before the tube can go through these pathological phenomena and in cases of true bacteræmia the Fallopian tube may not show any inflammatory changes. When inflammation of the tube occurs such inflammation is not generally confined to the tube but involves also the ovaries, the pelvic cellular tissue and the pelvic peritoneum.

Oophoritis Inflammation of the ovaries is not infrequent when either the pelvic cellular tissue or the Fallopian tubes are affected. As a result of such inflammation adhesions may form between the ovary and the Fallopian tube and in some cases the ovaries, the tubes and the pelvic cellular tissue may all be involved in a dense mass of adhesions which may be found to fill the whole of the pelvis on either side of the uterus and posteriorly. Ovarian infection may also be due to lymphatic involvement.

Parametritis This is not infrequent in cases of puerperal infection. The most common method of infection is through infected tears of the cervix. In other cases it may be secondary to a septic endometritis. In both cases it is due to infection with micro organisms through the lymphatic channels. As a result of such infection there is considerable oedema and induration of tissues which later may go on to suppuration. When suppuration occurs the whole of the pelvic connective tissue may be involved and an abscess develops which later opens into the rectum or through the vaginal fornix or points above the medial end of Poupart's ligament. In some cases the abscess may burst into the general peritoneal cavity or it may open into an abdominal viscus or point posteriorly into the lumbar triangle or burst through the sacro-coccygeal foramen. Occasionally the pus may burrow behind the peritoneum and point in the perinephritic area.

Perimetritis Where either the tubes or the ovaries or the pelvic cellular tissue are involved it is not unnatural that the peritoneum should share in the general inflammatory process. Pelvic peritonitis is very often associated with pelvic cellulitis and fortunately in the majority of cases the inflammation is confined to the pelvis. In other cases however it spreads to the general peritoneal cavity and indeed general peritonitis is not infrequent in the early stages of puerperal sepsis.

Puerperal peritonitis is caused in the majority of cases by streptococci. The most severe cases are those which arise within the first four days after delivery and these cases follow the rapid invasion of the peritoneal cavity by organisms which enter through the lymphatic vessels in the wall of the uterus. There is very often a blood infection and rarely any localised pelvic suppuration. Sometimes peritonitis occurs later in the puerperium and in such cases an associated localised pelvic suppuration is usually found either in the tubes, uterus or broad ligament or sometimes in the ovary. Thus it will be seen that general peritonitis may occur at one of two stages, very early in the course of the puerperium within the first four days when it is usually due to lymphatic infection and later as a secondary phenomenon in cases where inflammation of the adnexa or of the pelvic cellular tissue is present.

Generalised Infection This occurs in the condition known as bacteræmia and in such cases the micro organisms may cause either a septicæmia or a pyæmia. The usual micro organisms found are streptococci but occasionally pneumococci staphylococci *bacillus coli communis* gonococci *bacillus pyocyaneus* *bacillus aerogenes capsulatus* or several anaerobic organisms may be present. The entrance is gained in one of two ways —

- (1) The lymphatics being the commonest mode and
- (2) Through the blood vessels particularly the veins

The veins responsible for spread of infection are —

- (1) The ovarian veins which drain most of the placental site
- (2) The uterine veins which drain the placental site the cervix and upper portion of the vagina
- (3) The vesicovaginal plexus of veins in relation to the anterior vaginal wall
- (4) The rectovaginal plexus of veins in relation to the posterior vaginal wall

In some cases of bacteræmia thrombi formed in the veins are invaded by organisms become loosened and are disseminated. Such infected thrombi when disseminated may produce inflammation and suppuration in the areas where they lodge and in such cases the term pyæmia is used. The infection may thus spread to the lungs kidneys joints pericardium endocardium myocardium thyroid eyes brain and the intestines.

Phlegmasia alba dolens This usually results from the extension of thrombus formation from the pelvic veins and is generally secondary to infection. The veins which may be involved in this pathological lesion are the veins in the broad ligament especially the ovarian vein the femoral and popliteal veins and the superficial veins of the leg especially the saphenous veins. As a result of this there is swelling and induration noticed in the groin and in the labium of the affected side later the upper part of the thigh is swollen presenting a white or sometimes yellowish tint. It is hot to the touch and painful and tender putting on pressure with difficulty. Soon the whole limb is involved including the foot. Occasionally both extremities may be involved. The pelvic veins may be found full of infected thrombi and the veins themselves inflamed. There is also marked periphlebitis with extensive inflammatory œdema. The phlebitis may be primary or secondary to pelvic cellulitis or in some cases the cellulitis may be secondary to a phlebitis.

CLINICAL FEATURES

From a study of the pathological lesions in a case of puerperal infection it is obvious that the clinical features may vary within wide limits depending upon the nature and extent of the lesion and the particular tissues involved. Broadly speaking the symptoms may be grouped under two heads —

- (1) Clinical features due to localised infection
- (2) Clinical features due to generalised infection

A terminology that was formerly in use but is at present given up is —

- (1) *Syngnema* to indicate localised infection where saprophytic micro organisms are confined to particular areas of tissues in the generative tract and the toxins produced by them are absorbed into the blood stream—a condition which is also spoken of as a *toxæmia*
- (2) *Bacteræmia* or *septicæmia* where parasitic micro organisms gain admission to the blood stream so that both the toxins as well as the organisms are present in the general circulation

In many cases such clear cut demarcation is impossible and cases which start as localised infections may at any stage become generalised. In many cases also a certain amount of generalised infection may be present though the preponderating symptoms point to a localised infection. Still from a practical point of view it is desirable to differentiate between these two types of infection.

CLINICAL FEATURES OF LOCALISED INFECTION

As has been already stated in such cases micro organisms have gained admission to some portion of the generative tract and by developing therein produce a local reaction with absorption of the toxins. This is by far the commonest form of infection and the symptoms noted are —

(1) *Temperature and Pulse* The temperature is generally raised on the second or third day but in some cases of prolonged labour such infection may occur intrapartum. The pulse rate is also increased but is proportionate to the temperature.

(2) *The uterus* is generally slightly tender and does not involute properly. The fundus of the uterus may therefore be at a higher level than it should be for a given day of the puerperium.

(3) *The Lochia* The most striking change is noticeable in the lochia. This is increased in quantity has an offensive odour and changes its colour being more often brownish or black. The method of staining on the diaper will also reveal the fact that

decomposition has taken place consequent upon infection. Occasionally decomposed blood clots or even decomposed pieces of membranes or placental tissue may be present in the lochial discharge.

The patient may complain of some headache and general malaise. The tongue is coated, occasionally there may be a rigor, the bowels are constipated, but the general condition of the patient is not unsatisfactory and if properly treated the condition may be brought under control. If puerperal ulcers are present the vagina may be hot and tender and occasionally there may be a certain amount of vulvar and vaginal oedema if perineal ulcers are also present. If the perineum has been sutured it may be found swollen and oedematous and the sutures may cut through.

The special clinical features of a localised infection depend upon the particular tissues affected.

Pelvic Cellulitis or Parametritis. When pelvic cellulitis is present there is generally a rise of temperature associated with an accelerated pulse. This may begin on the third or fourth day. In some cases however if the patient attempts to get up too early or if ulcerations lower down the genital tract are neglected the infection may show itself at a later stage. The patient may complain of the general manifestations of toxæmia such as headache restlessness sleeplessness and general depression. The fever which may be continuous at the beginning may later be of a remittent type or repeated rigors with sweats may occur with a temperature of the hectic type. The temperature may gradually subside and the local symptoms abate.

On a local examination the exudate in the pelvic cellular tissue may be palpated as a firm resistant swelling at one or both sides of the uterus filling the pelvis and probably involving the whole of the pelvic organs. When it becomes more chronic the general swelling may be hard crescentic in shape and no differentiation of the uterus or the adnexa may be possible. This condition is spoken of as the plaster of Paris pelvis. If suppuration occurs softening of some portion of the mass may be felt and generally the abscess tends to point towards one or other of the vaginal fornices. In some cases the swelling may be palpated abdominally as a hard indurated mass rising above Poupart's ligament and the skin may become oedematous and sometimes reddened indicating that the abscess may point and evacuate itself externally. When the abscess opens it may burst into the rectum vagina the bladder or through the abdominal wall. With the evacuation of the abscess the pain and tenderness will be relieved and the temperature gradually abate. Cystitis pyelitis and in some cases even hydronephrosis may occur. Consequent upon the intrapelvic pressure oedema of the lower extremities and neuralgic attacks are not uncommon.

Salpingitis Oophoritis and Pelvic Peritonitis The possibilities of infection of the Fallopian tubes ovary and the pelvic peritoneum have already been discussed under the pathology of puerperal sepsis. When salpingitis and oophoritis occur there may be an exacerbation of the existing symptoms of uterine infection associated with pain in the lower abdomen particularly referable to either iliac fossa. There may be some rigidity of the abdominal wall associated with tenderness and tympanites. The temperature and pulse rate are elevated and on vaginal examination it may be possible to locate a definite mass on one or both sides of the uterus. When as a result of inflammation a pyosalpinx or a tubo ovarian mass forms this may fill the pouch of Douglas. Sometimes the tubo ovarian abscess bursts into the bladder or bowel or occasionally after becoming adherent to the anterior abdominal wall opens through it.

Pelvic peritonitis follows many cases of local puerperal infection such as parametritis endometritis salpingitis and oophoritis. The signs and symptoms depend upon the mode by which the peritoneum is infected. In the majority of cases the inflammation of the peritoneum is due to a lymphatic infection from the endometrium. When the peritoneum becomes involved pain is a prominent symptom nausea and vomiting may be present. There may be diarrhoea in the early stages but eventually there is constipation owing to the lack of peristalsis and abdominal distension occurs. Rigidity of the abdomen is present and the patient draws up her knees to relax the muscles of the abdomen. The expression is anxious and when the disease is well marked the eyes are sunken clammy sweats occur and the typical *facies hippocratica* develops. The temperature may vary especially after an initial rigor the pulse becomes very rapid the respirations hurried. In some cases the lungs may be involved in a secondary infection.

If the organism is virulent the symptoms become progressively worse. Infection spreads to the general peritoneum. If however the infection is limited to the pelvic peritoneum and is mild signs of localisation soon become apparent the pain begins to subside the vomiting ceases and the bowels begin to act. The tenderness and rigidity of the abdominal wall disappears. A bimanual examination may not be of much value and indeed in some cases if carelessly done may result in the bursting of an abscess into the general peritoneal cavity.

When the symptoms gradually subside the temperature comes down the pulse rate diminishes and the patient gradually recovers but such recovery is never complete as in the majority of cases adhesions are left and the tubes and ovaries have been extensively damaged. the uterus itself may be fixed in the inflammatory mass.

eosinophils. Anaemia rapidly develops due to toxic hemolysis. If the blood is cultured the presence of micro organisms particularly streptococci aerobic or anaerobic may be noted.

In cases where a more favourable termination is likely the temperature shows gradual remissions the pulse rate tends to slow down the blood pressure rises and a general improvement in the condition is noted. The skin becomes warm and the peritoneal symptoms gradually subside the bowels moving normally and the condition progressively improves.

PYEMIA

In this variety of general infection the thrombi are infected and wherever they lodge they give rise to secondary foci of suppuration. The common venous channels through which the infected thrombi may spread are the ovarian and uterine veins and later the hypogastric external iliac or femoral veins may be involved.

Clinical Features In cases of pyemia even more than in cases of bacteremia the symptoms of a local infection are manifest and in fact there may be gradual subsidence of these symptoms when suddenly the patient has a rigor followed by an elevation of temperature with an increase in pulse rate. The fever is generally high ranging between 105° and 106° and after a profuse sweat it may come down to below normal. Not infrequently within a few hours or sometimes the next day the rigor recurs with a sudden rise of temperature. In some cases the chills may occur at frequent intervals within the course of twenty four hours. They are probably due to fresh invasion of the organism through septic thrombi into the general circulation. The temperature is of a remittent type. A double rise within twenty four hours is not uncommon. The disease may last for weeks sometimes for months. At first the general condition is not seriously affected but later with increasing rigors and oscillating temperature the patient gradually weakens and the condition becomes worse. An examination of the blood will show marked leucocytosis with an increase of the polymorphonuclear element. Not infrequently metastatic abscesses develop the most common seats being the lungs joints kidneys subcutaneous tissues and the parotid. Sometimes metastatic deposits may occur in the brain and give rise to meningoencephalitis.

DIAGNOSIS OF PUERPERAL INFECTION

A healthy woman should not develop any pyrexia after confinement if adequate care has been taken. The puerperium should be apyrexial and unassociated with any disturbing factors. Unfortunately there are certain diseases which have a tendency to

manifest themselves and the most important cause of fever during the puerperium is septic infection. For this reason every case of fever occurring during the puerperium must first be considered as a possible case of puerperal infection until a thorough investigation reveals that the rise of temperature is due to some other definite cause and that there is no evidence of a genital infection. It need not be emphasised that in every case of child birth the temperature should be recorded at least twice a day in the morning and evening preferably every four hours, and any rise of temperature or acceleration in the pulse rate should be noted. A mild rise of temperature in the early stages of the puerperium is often not taken note of by the patient and if the precaution is not taken to obtain a record of the temperature it is not unlikely that the obstetrician will only be called in at a stage when the disease has taken a firm root.

Method of Investigation in a Case of Pyrexia during the Puerperium When a patient develops a rise of temperature in the puerperium a systematic examination is absolutely necessary. The history of the pregnancy and the nature of delivery should be elicited. The following scheme should be followed in all such cases.

History of Pregnancy It is important to take a careful history of the patient during the period of her pregnancy. Particular care should be taken to elicit any history of illness during pregnancy. Not infrequently particularly in the tropics pulmonary tuberculosis pyelitis malaria kala azar dysentery and diarrhoea helminthic infections etc. may have been present during pregnancy. It is not unlikely that in the puerperium there may be an exacerbation of these conditions owing to the lowered vitality of the patient. Particularly is it true of tuberculosis pyelitis and malaria. It is also important to note whether the patient was suffering from anæmia albuminuria or any symptoms suggestive of toxæmia or from any of the focal infections such as tonsillitis etc. In such cases a mild form of infection may occur in the puerperium. One must try to elicit the history of possible infection of the vagina particularly with gonococci. A purulent discharge in the course of pregnancy or a persistent leucorrhœa may sometimes be due to infection of the vaginal tract with micro-organisms which flares up during the puerperium. Similarly try to find out if the patient has had attacks of salpingitis prior to or in the early weeks of pregnancy. A history of sexual intercourse in the last weeks of pregnancy is another of the factors that should be elicited and it has been already referred to as a possible source of infection.

History of Delivery It is very important to obtain a full history of the course of labour. Was the labour prolonged? How many hours after rupture of the membranes was the delivery effected? What was the nature of the delivery whether natural

or assisted? If assisted what was the nature of the assistance and the technique adopted in the process of delivery? Was the child born alive or dead? or if born asphyxiated did it respond to treatment, and does it still survive? Was there any rise of temperature and pulse during labour? Was there any ante, intra, or post partum hemorrhage and if so what method of treatment was adopted to control such hemorrhage? Were internal examinations made, and if so, how frequently and by whom midwife or doctor, or both, or by untrained women? Was the after birth expelled naturally or manually removed and was it examined and found entire, or was the placenta or membranes incomplete?

Examination of the Patient After having obtained the history, a thorough examination of the patient should be made. This consists of —

- (a) General examination and
- (b) Local examination

The general examination includes the recording of the temperature, pulse and respiration the general condition of the patient, her expression whether the tongue is dry or moist whether the skin is moist or cold and clammy and whether the general appearance of the patient fits in with the rise of temperature and pulse rate. The patient should be asked whether she has any particular symptom, such as headache sleeplessness restlessness nausea and vomiting or diarrhoea etc.

The different systems should then be examined in detail.

Respiratory System Note the frequency of the respirations whether laboured. The lungs should be examined for any signs of pleurisy, pneumonia bronchopneumonia or tuberculosis.

Circulatory System A careful examination of the heart and particularly of the myocardium is necessary. The sounds must be auscultated. Particularly signs suggestive of a septic endocarditis or a myocarditis must be noted.

Alimentary System The abdomen should be carefully palpated, any evidence of tenderness rigidity or distension must be noted the size of the spleen and liver determined.

Urinary System The bladder should be palpated to find out if there is any distension, and the fact should be ascertained if the patient is able to pass urine herself or whether there is any incontinence or retention. The urine should be examined and if necessary a catheter specimen should be obtained. The presence or absence of albumin of deposits etc., should be noted and a microscopical examination made for the presence of pus cells or micro organisms. A cultural examination of the urine is very often necessary and not infrequently organisms may be isolated.

such as the *B coli*. The lumbar region should be palpated to note if there is any tenderness about the kidneys.

Generative System This requires very careful examination. By abdominal palpation the height of the uterine fundus, whether soft or well contracted, whether it is deflected to one side or the other, or displaced backwards, whether it is tender and painful. The nature of the lochia should be ascertained—its colour, method of staining on the diaper, odour, quality and quantity.

Local Examination In the majority of cases it is advisable to make a thorough local examination of the patient, and this should be done in a well regulated, carefully planned manner, with due antiseptic precautions. It is preferable to have the patient brought to a table and examined in good light.

After cleaning the external genitalia with a suitable antiseptic solution the perineum should first be examined for the presence of any tear, and, if sutured, its condition noted. It is important to determine whether the tear has involved the rectum or not, and if so, if faecal matter is liable to contaminate the perineal wound. Note also the presence of any œdema about the perineal laceration. If the perineum has been sutured it may be necessary, in the presence of œdema or of sloughs, to remove the sutures and to lay open the wound, after which the whole of the lacerated surface should be well cleaned up and touched up with an antiseptic such as mercurochrome, tincture iodine, or acriflavine.

The vagina is then examined for the presence of any lacerations or "puerperal ulcers," and after cleaning the vagina with a swab a speculum should be introduced and the cervix examined. It is important not to catch hold of the cervix by means of a volsellum as this may produce an additional tear with the risk of fresh infection. The fornices should be carefully examined to note if lacerations have extended to the fornices and if the pelvic cellular space has been opened up. At this stage the necessity or otherwise of taking an intra uterine swab for purposes of culture should be determined. We believe this should not be done as a matter of routine as in the majority of cases it is unnecessary and possibly harmful because of the danger of carrying infection upwards, particularly if there are lacerations about the cervix, or the cervix is unhealthy and ulcerated. In cases where there is definite clinical evidence of an infected endometrium, it is desirable to take an intra uterine swab for bacteriological investigation.

Technique of taking an Intra-Uterine Swab When it has been decided to take an intra uterine swab for bacteriological examination great care must be exercised in obtaining such a swab. The preliminary toilette should be carefully observed, the perineum and vagina cleaned with sterile saline, a posterior speculum inserted and the cervix cleaned with sterile normal

saline. If necessary, the cervix may be lightly held by a sponge forceps and exposed to good light, the special apparatus constructed for taking an intra uterine swab should be used. This consists of a long glass tubing into which is inserted a thin metallic wire, at one end of which is attached some sterile cotton wool. This tubing is closed at the upper end with a plug of cotton wool. The tubing with the wire inside is now inserted into a test tube whose mouth is closed with cotton wool. The whole of it is sterilised and kept ready. When the patient is put on the table and the preliminary preparations have been made, with the cervix well exposed the glass tubing is removed from the test tube, inserted through the cervical canal past the internal os. The metal wire with the cotton wool attached to its end which is well within the lumen of the glass tubing is then pushed through so as to pass beyond its open end into the uterus till it impinges on the endometrium. A swab is thus taken the wire is withdrawn into the lumen of the tubing and the two replaced into the sterile test tube the mouth of which is closed with sterile cotton wool and sent to the laboratory for examination.

Simultaneously with the bacteriological investigation of the uterine discharge a blood culture may also be done. A vaginal smear may also be sent for cultural examination.

Hæmatological Examination. Along with the above procedure a thorough hæmatological examination is necessary. This consists in estimating —

- (1) A total leucocytic count
- (2) A differential count of the leucocytes
- (3) A total red blood corpuscular count
- (4) The hæmoglobin percentage
- (5) The colour index
- (6) The presence of parasites particularly of *malaria* or of *kala-azar*



FIG. 213 —
Apparatus for taking uterine swab in a case of suspected puerperal sepsis

The necessity for the examination of urine both microscopical and cultural has already been stated. It is wise to examine the motions for the presence of ova and amœbæ. Not infrequently amœbiasis may be the cause of a rise of temperature or a helminthic infection either with round worms ankylostomes or tapeworms may sometimes be present, particularly in the tropics.

Other Examinations. The throat and especially the tonsils should be carefully examined. The presence of other abnormalities such as skin rashes, involvement of the joints or enlargement of

glands should be noted. The breasts should be carefully examined to note if the nipples are cracked or if there is any distension on account of retention of milk or actual inflammation.

While the presumptive diagnosis is in favour of a puerperal infection in every case where temperature manifests itself during the puerperium, it should by no means be forgotten that there are a number of other conditions which may be responsible for the temperature and which are more liable to occur during the puerperium than at other times. It is therefore necessary to eliminate the presence of these.

Not infrequently evidence of genital infection may be present, in association with signs of other causes of pyrexia, and it is in such cases particularly that a thorough examination is invaluable when attempting to assess the relative importance of each condition in a given case. It may prove disastrous to treat the case as one of puerperal infection, when all the time the essential factor is an entirely different one. We have known of cases of typhoid fever which unfortunately were mistaken for a severe puerperal septicæmia. *Per contra*, if clear signs of puerperal infection are not present it should not be presumed that other factors are wholly responsible and that puerperal sepsis is not present. After thorough examination a judicious consideration of the case is the only safeguard to prevent errors in either direction.

After a careful study of the case in the manner outlined above, the presumption that one is dealing with a case of puerperal infection may be arrived at. The questions that arise for consideration are —

- (a) Whether it is a local or a general infection?
- (b) Which particular part or parts of the generative tract are affected?
- (c) Whether there is anything retained in the uterus, or it is completely empty?
- (d) What the nature of the causative organism is, whether it is a streptococcus, staphylococcus, *B. coli*, gonococcus, or any other organism?
- (e) What the anatomical structures secondarily involved in the process of infection are, the state of the adnexa, of the pelvic connective tissue, of the pelvic peritoneum and of the general peritoneum, whether there are any secondary or metastatic deposits in other parts of the body?

The difference between a local and a general infection has already been stated. The nature of the temperature curve, the relation between the temperature and pulse, the general condition of the patient, the presence or absence of sleep, rigors, the character

of the lochia and the local condition of the parts will all enable one to come to a fairly accurate conclusion as to whether one is dealing with a local or generalised sepsis. The nature and extent of the infection may also be judged therefrom.

Prognosis

Puerperal sepsis is still the gravest of all the complications of child birth. In spite of the great advances that have been made in recent years in the technique of aseptic and antiseptic surgery, it is a matter for no small concern to the obstetrician that puerperal sepsis has shown no tendency to decline. The reports from various countries go to prove that of the total maternal mortality nearly 40 per cent of the deaths are due to puerperal sepsis. The mortality due to sepsis has remained almost stationary in Great Britain for the past fifteen years and in other countries as well it has shown no definite decline. When it is realised that sepsis is a preventable factor and that in the large majority of cases it is due to extrinsic and not to intrinsic causes the extent of the preventable mortality of child birth can easily be appreciated. In fact it may be stated that one of the most important directions in which maternal mortality can be reduced is by the avoidance of sepsis.

The prognosis varies with the nature of the infection, the organisms concerned and the extent of involvement of the tissues. A localised infection is not so serious as a generalised infection.

The prognosis must be considered from two points of view —

- (1) The immediate effects and
- (2) The remote effects

(1) So far as the *immediate effects* are concerned the question is whether or not the patient will survive. Bacteriæmia and pyæmia are of much graver prognostic significance than local infections. Ordinarily vulvitis and vaginitis are not serious if properly cared for in time. Endometritis is of graver significance but in the majority of cases with appropriate treatment it tends to subside. Parametritis may in some cases lead to the spread of the infection into the peritoneum but otherwise generally yields to treatment. The development of peritonitis is of more serious significance. General peritonitis is almost always fatal. In bacteriæmia or general septicæmia the mortality is very great about 70 to 80 per cent of the patients dying. Pyæmia also has a fairly high mortality. The condition of phlegmasia alba dolens has a more favourable prognosis.

The nature of the invading organism has also to be taken into consideration. Puerperal tetanus is a most fatal complication. Streptococcal infection particularly with the hæmolytic type

would appear to be more severe than other infections. Infection with *B. coli*, although occasionally of serious import, yields more readily to treatment than infection by streptococci. The gonococcus is said to be less dangerous than the pyogenic organisms, but occasionally it may set up a virulent type of septicæmia which may end fatally.

Among other factors to be considered in arriving at a prognosis are the range of temperature, the presence or absence of rigors, the time of onset of the symptoms during the puerperium, the rate and nature of the pulse (a rapid pulse being a bad sign), the presence of delirium, sleeplessness, pulmonary complications, evidence of septic endocarditis or diarrhœa due to a peritonitis.

An examination of the blood may be of some use in arriving at a prognosis. A rapid decline of the number of red cells or a severe degree of anemia is of grave significance. A leucocytosis is the rule but a leucopenia is serious. When the blood culture is positive and bacteria are isolated the prognosis is bad. Complications such as albuminuria, urinary infections, metastatic deposits or other diseases such as tuberculosis add materially to the risks of the condition. Considering everything, it is risky to give any definite prognosis in cases of puerperal infection—more so in the bacteriæmia type. Occasionally what may appear to be a mild infection flares up into a severe type and ends fatally. Much depends of course, upon the nature of the treatment adopted in such mild cases. In the more severe type of infection the obstetrician soon realises that little can be done to arrest spread.

(2) *Remote Effects*. When a patient who has had puerperal infection recovers a certain amount of permanent damage is inevitable, the nature and extent of which depend upon the degree to which the various anatomical structures have been involved. Not infrequently after a severe local infection and in some cases after a generalised infection, it will be found that the tubes and ovaries are permanently damaged, as well as the parametrium, that adhesions to the surrounding viscera are present, that the uterus is displaced and that adhesions involve the bladder, uterus, tubes, ovaries, intestines, omentum and occasionally the abdominal wall. Rarely the result of the infection may be a permanently diseased tube, which persists either as a pyosalpinx or as a tubo-ovarian abscess, and this becomes adherent to the surrounding structures, sometimes to the posterior surface of the anterior abdominal wall and, after months, may burst through it. The appendix is not infrequently involved in this inflammatory mass, and it may be adherent to the abdominal ostium of the Fallopian tube on the right side. As a result of these various sequelæ the patient becomes a chronic invalid and may suffer from dysmenorrhœa, menorrhagia and sterility.

Treatment

The treatment of this condition may be dealt with under two heads—prophylactic and curative

PROPHYLACTIC

Nowhere is the maxim *prevention is better than cure* more applicable than to this condition. In dealing with the subject of prophylaxis we shall refer to three aspects of this question. Already reference has been made to the soil the sower and the seed in considering the aetiology of puerperal sepsis.

The Soil A great deal can be done through proper antenatal care in its widest sense to ward off the possibilities of infection. The resistance of the patient should be increased in every way. All possible sources of infection should be removed and particular care should be taken to eradicate focal sepsis—the teeth the bowels and the urinary tract should be attended to. Anæmia when present should be treated. Particularly in the tropics we find that it is rare to meet with a pregnant woman whose hæmoglobin percentage comes up to even 80 or 85. It has been suggested that lack of the anti-infective vitamin A may predispose such cases to infection. On this basis a large number of women have been treated with vitamin A in the shape of cod liver oil or similar preparations.

Early recognition and treatment of certain complications chiefly the toxæmias anæmias inflammatory lesions such as pyelitis cystitis cervicitis vaginitis etc. are necessary to minimise the chances of infection. Conditions likely to lead to lowered resistance such as antepartum and postpartum hæmorrhage prolonged and exhausting labour should be avoided or controlled.

A personal prophylaxis so far as the patient herself is concerned is very essential. A clean bath clean clothing avoidance of fatigue especially in the later period of pregnancy and keeping the general system at its maximum efficiency will do much to prevent infection.

If there is any infective discharge from the vagina it must be dealt with antenatally and the cause removed. The need for avoidance of coitus during the later months of pregnancy has already been emphasised.

The Sower There is no doubt that in the large majority of cases the infection is exogenous and the responsibility for infection of the patient rests with the obstetric attendant. Sufficient emphasis cannot be laid on this fact and it is for this reason that the most elaborate care should be taken in conducting a case of labour. The obstetrician entrusted with a case should make sure that he is himself not the carrier of any infection. Any injuries or

wounds about the hands any form of infection particularly of the nose throat or other portions of the respiratory tract a recent attack of or association with a contagious or infectious disease should be a sufficient reason for him to avoid attending on any case of labour. Strict personal prophylaxis is absolutely essential if the best results are to be obtained in obstetric practice. We have referred to the risks of droplet infection particularly in cold climates and in closed surroundings. The attendant obstetrician should take care to see that labour is conducted with strict aseptic and antiseptic precautions. All articles to be used must be sterilised. sterile gloves masks and aprons should be used and great care taken to see that the vagina and perineum are properly prepared and rendered antiseptic.

A very good rule is never to make a vaginal examination unless it is definitely indicated. We are convinced that in the large majority of cases no vaginal examination is necessary. If the head is properly engaged if there is no disproportion if labour is progressing favourably and if the membranes rupture spontaneously at the beginning of the second stage of labour and there are no signs suggestive of foetal or maternal distress there is no reason for a vaginal examination to be made. We do not advocate a routine vaginal examination immediately after the membranes have ruptured unless there is reason to suspect that owing to disproportion or an abnormal presentation or non fixation of the head there is a possibility of prolapse of the cord. Where the head is already engaged before the membranes have ruptured and thus fills the pelvic brim or cavity such a contingency cannot arise. Another point to emphasise is that in long labours the number of vaginal examinations should be strictly limited. Despite all the precautions that one may take despite the use of gloves and antiseptics there is an undoubted risk which increases almost in geometric progression with every additional vaginal examination. In view of this risk it has been suggested that a rectal examination may possibly be the better method of ascertaining the facts and at the same time avoiding infection. We have given consideration to this question but confess that we are unable to see any advantage as after a rectal examination the same obstetrician has to conduct labour and in spite of the use of gloves when making the rectal examination there is a certain element of risk which we do not think is negligible. Further there is the disadvantage that the information obtained from a rectal examination is not so complete as when a vaginal examination is made. Many details connected with the vagina and the cervix and the presenting part cannot be ascertained as definitely by a rectal examination. For these reasons we have not practised nor do we advocate rectal examinations during labour.

A golden rule in the conduct of labour is to *avoid trauma* as far as possible. It is true that in some cases a certain amount is inevitable, but in the large majority of cases if proper precautions are taken, trauma of the parts can be minimised both in natural and assisted deliveries. Bruising of the parts particularly of the vagina lacerations of the cervix, injuries to the vaginal mucous membrane about the fornices and irregular tears of the perineum add to the risks of infection. Perineal tears which extend into the rectum are particularly dangerous because of the increased possibilities of faecal infection of the vaginal tract. It is to avoid these that a lateral episiotomy is sometimes indicated. When tears do occur, it is essential that they should be properly repaired immediately after delivery.

Another important condition to be borne in mind is the necessity for preventing devitalisation of the soft parts. This particularly occurs in cases of prolonged labour and especially in cases where the cephalic pole is allowed to lie in the pelvic cavity for a long time. We have advocated that if the presenting part is in the pelvic cavity for some time and the cervix is fully dilated no object is gained by leaving it there and delaying interference till signs of foetal distress manifest themselves. On the other hand, the prolonged pressure of the presenting part on the pelvic soft structures is bound to devitalise them and leads to necrosis and formation of fistulous tracts between the vagina and the bladder or rectum as well as rendering them more easily liable to septic infection.

In the course of operative deliveries great care must be taken to see that manipulations are performed gently and skilfully rough handling being avoided. In this respect we must express the opinion that the forceps which is one of the most useful and beneficent of obstetric instruments may in the hands of those not perfectly versed in the technique, prove to be the most dangerous of instruments. In the application of the blades of the forceps in the locking of the forceps, and in traction great care must be exercised to prevent bruising. Occasionally the forceps tends to slip and the obstetrician should immediately realise that this is likely to lead to extensive lacerations of the vaginal wall and stop traction. It is also necessary to see that in traction with forceps the head does not emerge from the vagina too suddenly, as it sometimes does in imperfectly rotated occipito posterior positions.

Intra uterine manipulations, when necessitated, should be done with great care. Manual removal of the placenta has always been a matter of grave anxiety to obstetricians and quite justifiably so.

The Seed These are the micro organisms that gain admission into the generative tract either at the time of labour or immediately thereafter. In some cases pathogenic organisms may be present

in the generative tract before the onset of labour and if lacerations occur they may gain entrance easily and light up a virulent infection.

The question of suitable antiseptics for use in cases of labour has been debated at great length.

The Place of Domiciliary and Institutional Midwifery in the Prophylaxis of Puerperal Infection An important point to realise is that in cases of complicated labour, particularly where operative interference is required it is a matter for serious consideration whether the patient should be delivered in her own house or in a maternity institution. There is no doubt that much will depend upon the surroundings, but unless one is perfectly satisfied that conditions closely approximating to those obtaining in a well-equipped maternity institution are available in the home, it is not safe to conduct operative deliveries in the house. On the other hand it must be confessed that a maternity institution itself may be a grave risk unless efficiently run. Those in charge of these institutions should see that every little detail is properly attended to to prevent the possibilities of puerperal infection. It is unfortunate that even at the present day occasional epidemics of puerperal infection occur in maternity hospitals.

The organisation of a puerperal unit requires much care and forethought. In a well equipped maternity institution there should be provision for delivering and treating separately during the puerperium cases which are perfectly clean and have not been exposed to any risk of infection. A separate unit should be available for delivering and treating all suspect or frankly septic cases. It would be well if only "booked" cases, that is cases which have been registered and have been regularly attending the antenatal clinic attached to the institution were admitted into the "clean" delivery wards. There should be separate rooms for receiving the patient to examine her. After the preliminary examination the patient should have a bath, should put on clean clothing and then be taken into the waiting ward for cases early in labour. So far as the actual delivery itself is concerned our practice is to take these cases on to the delivery boards at a late stage in labour, and after delivering them there remove them to a recovery ward or some times after two to four hours to the puerperal wards, if there be no complications.

We have for several years now had attached to these delivery wards, a separate operative delivery room into which every patient who requires operative interference is wheeled. This operative delivery room is equipped just like a surgical operating theatre and is always ready to receive emergencies so that there is no necessity for any hurry in the preparation of the theatre, the instruments, or the dressings etc. We think it is a fundamental mistake to attempt operative deliveries in rooms where normal deliveries

generally take place, and one of the ways by which the incidence of puerperal sepsis can be reduced is by having a separate operative delivery room for clean cases while in the ordinary delivery rooms only spontaneous deliveries occur. It is true that occasionally after delivery a case may require some active interference for example, to control postpartum hæmorrhage, but such cases are few and far between and do not seriously undermine our contention that the safest place for a woman who requires assistance during labour is a separate operative delivery room closely attached to the main delivery rooms.

The delivery rooms should be in charge of a competent midwife who should have a sufficient number of assistants to permit of a nurse with *good obstetric training being present at every delivery*. There should be one or more house surgeons who do not handle septic or suspect cases always available for service in the delivery rooms. Rules for the delivery rooms should be formulated and posted, and the detailed arrangements with regard to aseptic and antiseptic care to be followed in the labour ward should be carefully thought out and rigorously enforced.

In the "clean" puerperal wards we would advocate the desirability of separating as far as possible operative deliveries from normal labours. The chances of infection are increased when normal labours and operative deliveries are kept side by side for in the early days of the puerperium it is impossible to say with any degree of certainty if an artificially delivered case may not show a slight or more severe degree of infection. For this reason it would appear a preferable plan to divide the puerperal wards for clean cases into two sections one which receives the normal cases and the other which receives the operative delivery cases. In large maternity institutions it may be possible to have a third puerperal ward where cases with some previous disease complicating pregnancy and labour may be kept separate such as cases of toxæmias of pregnancy, accidental hæmorrhage, anæmia and febrile conditions unassociated with genital sepsis etc.

On the occurrence of infection in any of these wards the patient should be immediately transferred to a separate pavilion ear marked for the treatment of suspect or septic puerperal cases. It is only by a very careful watch over all these factors that the incidence and spread of puerperal infection can be materially reduced.

The Suspect and Septic Cases We have already referred to the fact that these cases should be separately treated. They should be delivered in a separate pavilion of the hospital and it is desirable that each such suspect or septic case should be delivered in a separate cubicle, warded off entirely from the adjacent cubicle. Special nurses and house surgeons should be available for

the conduct of such cases and such cases alone. A separate theatre should be available so that cases can be wheeled into it and any necessary operative delivery undertaken. After delivery these cases are nursed in special puerperal wards, and it is desirable wherever possible to limit these wards to small units of four to eight beds at a maximum. We prefer separate rooms for some cases and although the difficulties of nursing are increased by isolation of patients in separate rooms during the puerperium the advantage is all the greater in that the risk of cross infection is rendered almost negligible. In the puerperal wards attached to this septic section some should be for suspected cases and others for frankly septic cases. All cases from the clean puerperal wards showing any signs of puerperal infection are naturally transferred into the septic puerperal section.

In this connection we should like to refer to a common practice which obtains in most modern institutions of transferring cases of puerperal infection to isolation hospitals. We regret we are unable to understand the rationale of this procedure, for we believe that if a separate pavilion is available far off from the main puerperal and labour ward, there is no reason why such cases should not be treated in such pavilions. Moreover the care of an expert obstetrician is needed to a greater degree for such cases and if these patients are transferred to an infectious diseases hospital it is not always possible to get that amount of care necessary from the point of view of obstetrics. Nor do we feel that cases of puerperal infection are analogous to cases of infectious diseases such as scarlet fever, small pox, chicken pox, etc. and should therefore be transferred to an infectious diseases hospital. At the Government Hospital for Women and Children, Madras, during the last thirty years the practice has been to treat these septic cases in a separate pavilion of the hospital far removed from the clean puerperal and labour ward, with a separate nursing staff and we have never known of any epidemic developing therefrom. Much care and constant supervision are undoubtedly required when a separate septic pavilion is attached to a maternity institution.

CURATIVE

It is now becoming generally recognised that the best results in cases of puerperal infection are to be obtained by aiding nature and by interfering as little as possible with the generative tract. It is however necessary to determine the nature of the infection and the extent of its invasion before resorting to any particular line of treatment. It is also essential that any other factors that may have a bearing on the causation of the puerperal pyrexia be thoroughly investigated and suitably treated. We have already

referred to the fact that there are a number of other infections that may manifest themselves, and that it is not always puerperal sepsis that is the cause of a febrile condition.

The majority of cases of puerperal infection are fortunately of a mild nature, and it is with these that the best results are obtained. If the patient be properly treated at this stage the chances of the infection spreading are minimised.

Local Treatment The condition of the perineum should be noted, if there are any signs of inflammation or marked cedema in a perineum that has been sutured it is desirable to remove the sutures and lay open the wound to favour free drainage. The vagina should be carefully examined and if there are any puerperal ulcers they should be touched with a suitable antiseptic such as mercurochrome, iodised phenol 12% tincture benzoin co. etc. Hot vaginal douches are given twice daily to clean the vagina and the cervix to favour separation of sloughs and promote uterine contractions. A large number of antiseptic solutions have been suggested but it is the mechanical factor of the douching rather than the antiseptic property of the fluid that counts. If the lochia is offensive irrigations with eusol or iodine solution (1 drachm to 1 pint) are preferable otherwise an ordinary saline douche (1 drachm to 1 pint) will suffice. The douche should be given with the following precautions the douche can should not be held too high the temperature of the fluid should be between 110° to 120° F, the douche water should be sprayed into the vagina and should not pass into the cervical canal, and it should escape freely from the vaginal cavity. In the majority of cases these simple measures, combined with elevation of the head of the bed to favour free uterine and vaginal drainage and the administration of echolics to stimulate uterine contraction and involution will be found sufficient to bring down the temperature and to promote convalescence. A common echolic preparation given is a mixture of liquid extract of ergot 10 to 15 minims and quinine bishydrochloride, 2 to 3 grains per dose three daily. The temperature usually comes down in three or four days the lochia changes in colour and becomes more healthy the uterus involutes rapidly the puerperal ulcers tend to heal and the general condition is greatly improved. The patient's appetite returns gradually and she sleeps better, so that medication may be gradually discontinued.

Special Methods of Local Treatment Besides the measures that have been described many others have been advocated some of which are desirable while others are positively harmful and should be avoided. The following are some of these methods.

Remington Hobbs Treatment Hobbs recommended the injection of sterile glycerine into the uterus with a view to promote a free flow of lymph so as to obtain its bactericidal effect on the organisms.

For this purpose the patient should be placed on the operating table the genitalia properly cleaned and the vagina douched and swabbed with some antiseptic after the cervical os has been carefully cleaned a soft rubber catheter is passed by sight into the uterus and two to three ounces of glycerine injected through it. The rubber catheter may be left in the uterine cavity and the glycerine injected periodically. It has been claimed that this method of glycerine drainage has resulted in the clearing up of the local infection within a short period. Hobbs method has produced favourable results in local uterine infections but where the infection has spread into the pelvic cellular tissue or the tubes and ovaries other lines of treatment are indicated.

The Carrel Dain Method This method came into vogue during the Great War following the experience of treatment of wound infections. This consists in continuous disinfection with hypochlorite solution. A series of rubber tubes are passed into the uterine cavity at different levels and connected with a long glass tube through which the hypochlorite solution flows so that there is a continuous irrigation of the uterus.

The method has not proved to be of much value and has now few supporters.

Intra uterine Douching Intra uterine douching with an antiseptic solution or with normal saline was recommended as a method of washing out the uterus and so preventing the accumulation of foul discharge. It came to be realised however that this method of treatment was attended with some risks. It does not achieve the purpose intended because—

- (1) The douche has no effect upon the bacteria which have already gained admission into the deeper layers of the endometrium or the musculature.
- (2) The intra uterine douche induces a severe reaction and the patient generally develops a rigor with hyperpyrexia soon after it has been given.
- (3) Not infrequently the douche far from removing the septic material disseminates it either through the open sinuses or even through the uterine ends of the Fallopian tubes.
- (4) Air embolism is by no means a remote danger.
- (5) If carelessly given the uterine wall which is diseased may easily be perforated.
- (6) Lastly sudden death has sometimes occurred after such a douche.

It is several years now since we gave up this practice and it must be confessed that our results have been far more encouraging.

Curettage If intra uterine douching is not a safe procedure curettage is even more risky. The dangers of curettage are many

and there is little or no advantage in this operation. It is difficult effectively to curette the puerperal uterus so as to remove all the diseased endometrium but even if this can be done it should be realised that curettage does not in any way affect the bacterial layer which, as has been stated, may be in the musculature of the uterus. Far from removing the bacteria the curettage may remove the protective layer of leucocytes and thus help in the rapid dissemination of infection into the general blood stream. Perforation of the uterus is not an uncommon occurrence while the possibilities of spread of infection through the Fallopian tubes or into the cellular tissue are by no means negligible. Curettage is therefore condemned and has no place in the treatment of puerperal infection.

The milder form of curettage with the fingers is equally unnecessary and undesirable save in those extreme cases where secondary hæmorrhage occurs the hæmorrhage being the result of a placental polypus or some pieces of retained placenta or membranes.

Touching the inside of the uterus with some antiseptics was a favoured method of treatment at one time. It was in the hope that the antiseptic would effectively destroy the micro organisms in the uterine cavity. That hope has not been realised and it is now more clearly understood that such interference with the uterine cavity is harmful in view of the possibilities of introducing additional organisms and destroying the leucocytic barrier layer.

Treatment of Lochiometra. Occasionally in mild infections the uterus may be found retrodisplaced and distended with retained lochia. This is known as lochiometra. If this becomes infected it is converted into a pyometra. It is necessary to favour drainage which is effected in the majority of cases by vaginal douches postural methods such as replacing the uterus in an anteverted position and nursing in the Fowler position as well as by using ecboles. Occasionally it may be necessary to empty the uterus by passing a double channelled catheter or a Budin's tube. This is merely to evacuate the contents of the uterus and if it is carefully done with proper antiseptic precautions it should not be attended with any risk.

It will be clear from what has been stated above that there is little advantage to be gained by interfering with the generative tract and particularly that all intra uterine manipulations should be strictly avoided in the treatment of this condition. We are convinced that in spite of all precautions that may be taken any form of intra uterine manipulation is attended with risk and is more likely to exacerbate the condition than relieve it. Except in cases complicated by secondary hæmorrhage or lochiometra we have entirely given up this procedure.

Even so far as local treatment is concerned we have limited it to the minimum extent possible

Of late we have been trying the *cod-liver oil method of treatment* in local infections. This consists in soaking a piece of sterilised gauze in pure fresh cod liver oil and inserting it with proper precautions into the vaginal cavity. The gauze is kept in for periods of from twenty four to forty-eight hours. The patient is treated on the general lines already suggested for local infection except that no vaginal douches are given. We have found this method of treatment exceedingly useful in cases of mild infection associated with lacerations of the vagina or cervix. The sloughs separate and the cervix and vagina present a healthy appearance in the course of forty-eight to seventy two hours. A great advantage in this method of treatment in local infection is that frequent vaginal manipulations or douches are not necessary and that the obstetrician can himself with due precaution introduce the gauze and remove it at intervals of from twenty four to forty-eight hours.

Whatever may be said as to the value of vaginal irrigation it must be realised that in careless hands it constitutes a source of danger not to speak of the inconvenience that is experienced by the patient by repeated douching during the twenty four hours. The cod liver oil gauze method of treatment which has been so successfully adopted in surgical cases has in our opinion a very definite place in the treatment of puerperal infection particularly in cases associated with large tears of the cervix vagina perineum or of the fornices with involvement of the cellular tissue and is well worth a trial.

General Treatment. The general condition of the patient should be maintained. Fresh air good light plenty of sunshine if possible light and nutritious diet and the promotion of sleep are important. Physical and mental rest is the essence of good treatment. Visitors should be limited at least till the condition definitely improves. It is better to stop nursing the child for a few days and in such cases care must be taken to see that the breasts do not become distended with milk. For the fever sponging of the extremities an ice bag to the head and mild diaphoretics are useful. Strong antipyretics are better avoided in view of the subsequent depression.

The Bowels. Mild laxatives are usually necessary to keep the bowels open. A troublesome complication in some cases is diarrhoea and is more dangerous in cases where perineal lacerations of an extensive nature are present. It is here that careful nursing is essential to see that the parts are cleaned properly after each evacuation. If the diarrhoea is persistent small doses of bismuth and pulvis creta aromaticus may be necessary or a starch and opium enema is occasionally useful. In cases of vomiting particular

care should be taken to see if it is a sign of commencing peritonitis. Distension of the intestines may sometimes prove troublesome. Turpentine enemata, mag. sulph. in divided doses of a drachm each, eserine salicylate (1/100 grain) and pituitrin (4 c.c.) may be given and repeated if necessary. The rectal tube, passed high is sometimes of use.

Diet. The diet should be light and nutritious and generally liquid. Milk, buttermilk, conees, fruit juice and soft gruel may be given. The diet should be regulated according to previous habits of the patient. There is no reason why in the tropics the patient accustomed to rice diet should not be given soft boiled rice in a semi liquid form. If the condition improves semi solids may be given. Glucose can be given freely with fruit juice. Formerly alcohol was used in large quantities. This has now been found to be quite unnecessary but occasionally a small dose may be beneficial for procuring sleep and for those accustomed to its use.

Vitamin Therapy. We have already referred to the part played by the anti infective vitamin—vitamin A—in the prophylaxis of puerperal infection. We should like to state now that in many cases particularly of mild infections the administration of vitamin A is distinctly beneficial to the patient. Preparations which contain concentrated doses of vitamins A and D have been given in such cases with beneficent results.

Specific Treatment. Many specific treatments have been advocated from time to time but experience has shown that the majority of these are neither indicated nor beneficial. Of these may be mentioned —

Serum and Vaccine Therapy. A considerable amount of controversy is still raging round the question of the value of sera and vaccines in puerperal infection. It would appear from the experience of many observers that serum has a place in the prophylactic treatment of puerperal infection. We have found that when infection has actually occurred serum is of doubtful value. As a prophylactic it should be given in all cases of operative delivery particularly if there is the remotest suspicion of the possibility of infection. Cases handled outside hospital or by untrained midwives or cases which show evidence of intrapartum infection should be given as soon as delivery is over an injection of 30 to 50 c.c. of antistreptococcal serum hypodermically. The dose may be repeated at intervals of twelve hours and generally not more than three doses need be given. Care should be taken to watch for signs of anaphylaxis.

Vaccine therapy has also been tried. There are two ways in which vaccine therapy might be utilised —

(1) As a prophylactic vaccine therapy has been given in the last weeks of pregnancy or immediately after labour. A polyvalent

combined vaccine prepared from a number of strains of puerperal streptococci or staphylococci has been used for this purpose

(2) An autovaccine has also been tried. The difficulties in regard to autovaccine are twofold. (a) it takes time to prepare an autovaccine and in cases of generalised infection where the disease takes an acute course the vaccine is not available in time. (b) it is difficult to determine the particular organism that is the cause of the infection and therefore an autovaccine may prove ineffective. On the whole both the serum and vaccine therapies have not reached expectation.

Protein Shock Therapy This has a limited place in certain types of puerperal infection. We do not think that protein therapy is of any use in the acute infective stage. On the other hand in the chronic type of cases where a pelvic cellulitis or a thrombophlebitis persists it is of use.

This is generally done by giving injections of sterilised defatted milk. The dose may vary from 1 to 5 c.c. We do not think that large doses are needed as a small reaction is quite sufficient to bring about the desired result. The foreign protein stimulates the natural immunising functions of the body especially the reticulo-endothelial system.

Chemiotherapy A large number of chemical substances have been used intravenously in the treatment of puerperal infection. Among these may be mentioned preparations of arsenic and mercury such as salvarsan colloidal silver salts such as collargol mercurochrome neutral iodine gentian violet eusol etc. It seems to us that particular care should be taken in the intravenous injection of any of these chemical substances in the puerperium. Excepting injections of neutral iodine in suitable cases the other chemicals have not proved of much value.

Recently sulphonamide has been introduced as a specific for streptococcal infections and is being used extensively in the treatment of puerperal fever. Reports from maternity hospitals indicate a reduction in the virulence of infections and even a lowered incidence of the disease when it is employed prophylactically. It may be given orally or by intramuscular or intravenous injection. Frequently some degree of cyanosis appears due to the presence of sulph. or met-hæmoglobin but this need cause no alarm although indicating the necessity for a reduction in the dosage.

Transfusion To supply the patient with the proper antibodies blood has been transfused from suitable donors. The blood of a convalescent puerperal woman has been used in the hope that in such a blood the antibodies will be at their maximum. In some cases a stimulant injection of vaccine has been given 500 to 1000 millions to the donor and the blood drawn four to eight hours later and injected into the recipient. On the whole it cannot be said

that the results of such immuno transfusion have been very satisfactory

Injections of Saline To maintain the general health of the patient and also to dilute the toxins saline has sometimes been given by the drop method per rectum sometimes subcutaneously and sometimes with glucose intravenously

Counter irritants This method of treatment would appear to be more favoured by the French school of obstetrics It consists in producing what is known as an abscess of fixation Injections of turpentine 10 to 20 cc deep into the thigh or in the gluteal region in order to produce an abscess and thus favour a leucocytosis have been tried in several cases For a similar reason injections of nuclein may sometimes be given

Surgical Measures In view of the desperate nature of the condition in some cases attention has naturally been directed to the possibilities of surgical methods of treatment but experience shows that such methods have not proved as beneficial as they were at one time expected to be This is not surprising as in the majority of cases these desperate measures have to be undertaken either at too early a stage when they may be quite unnecessary or at such a late stage that they are quite useless

Among the surgical methods advocated are hysterectomy and ligation of pelvic veins

A hysterectomy is carried out in the puerperium for certain conditions such as a ruptured uterus a degenerating fibroid complicating the puerperium cancer of the cervix some cases of molar pregnancy in cases of placenta accreta or in certain cases of inverted infected uterus Hysterectomy as a method of treatment in septicemia has proved useless In cases which have recovered it is doubtful whether the operation was necessary in cases that have died the inference may be drawn that the operation should have been done at an earlier stage As a practical measure therefore it has little or no place in the treatment of puerperal infection

Ligation of Pelvic Veins Following on the analogy of the control of infection in cases of lateral sinus thrombosis it was suggested that if some of the veins responsible for spread of the infection were also ligated such dissemination might be controlled The veins which may be ligated are the ovarian the internal iliac and the common iliac veins The technique of the operation is comparatively simple The usual method adopted is the extra peritoneal route But the difficulty lies in making an accurate pre operative diagnosis as to whether any veins are thrombosed and if so which of them ?

On the whole it may be said that the results of operative measures so far have not been encouraging and cannot be said to constitute any definite advance in the treatment of puerperal infection

Operations such as colpotomy in cases of pelvic abscess and laparotomy and drainage in cases of peritonitis are, however, useful for the complications arising in cases of puerperal sepsis

COMPLICATIONS

Several complications may occur in the course of puerperal infection which may aggravate the condition. They must be carefully watched for, and when definite signs and symptoms are present suitable treatment should be adopted

Among these complications may be mentioned —

- (1) General peritonitis
- (2) Pelvic cellulitis
- (3) Salpingitis and oöphoritis
- (4) Pyæmic abscesses
- (5) Infection of the urinary tract
- (6) Phlebitis—phlegmasia alba dolens
- (7) Puerperal psychosis

Peritonitis

Infection of the general peritoneal cavity may occur at two stages in the course of puerperal infection —

- (1) Early in the disease on the second or third day
- (2) Late in the course of infection as a result of extension of pelvic peritonitis

The onset of peritonitis must be watched for carefully. It occurs on the second or third day after delivery, and the signs and symptoms vary so considerably that they may sometimes escape attention. In cases which develop the condition within the first three or four days after parturition the patient is nearly always already acutely ill with puerperal fever. The onset of peritonitis is marked by a change for the worse in the general condition. The onset in the early stages is insidious. A rigor may sometimes occur, the pulse is rapid and its tension low, a certain amount of pain and vague discomfort may be felt in the region of the umbilicus. Occasionally, a profuse diarrhoea may set in. The physical signs referable to the abdomen are few and difficult to interpret. Distension of the lower part of the abdomen is one of the earliest and most important sign. Gradually the distension increases until just before death the abdomen may be very tense. There is almost always tenderness particularly in the hypogastric and iliac regions. Rigidity of the abdomen is not usually present, and this sometimes accounts for failing to diagnose the condition. Signs of free fluid in the abdomen are

present in advanced cases, but by the time these are found the prognosis is usually hopeless. Careful watch must be kept hour after hour, and the decision to operate must be taken at a very early stage before any pronounced physical signs or symptoms manifest themselves. Unless the patient is operated on within a few hours after the onset of peritonitis the prognosis is unfavourable.

Signs and Symptoms of Peritonitis developing at a Later Stage in the Puerperium In such cases the peritonitis develops several days after delivery and often there are local foci of suppuration in the pelvis. Clinical evidence will therefore be available of puerperal infection and involvement of some of the pelvic structures. Typically the onset of puerperal peritonitis is signalled by three symptoms—a rigor abdominal pain and greatly increased pulse rate. They form a characteristic triad whose importance can never be ignored. Abdominal pain usually accompanies the initial rigor, and in almost every case it is severe, sometimes even agonising. The pain is continuous in character, but sometimes it occurs in severe intermittent spasms causing the patient to suffer agonies. The initial pain may be referred to the umbilical or the hypogastric regions but as the infection spreads it becomes more generalised. The pain persists for two to three days with varying severity, but later it assumes a stabbing character, exacerbated by the slightest movement or by breathing.

Synchronously with the rigor the pulse rate rises to 120 or above and remains rapid even after the temperature has fallen. A persistently high pulse rate is one of the most significant of clinical signs. Respirations are increased in rate, the appetite is lost, vomiting is not a constant feature, the bowels are usually constipated but in some cases diarrhoea is an important early symptom. Painful micturition and not uncommonly actual retention of urine have been noted. The patient appears seriously ill and very soon after the onset of the condition the face wears an

Operations such as colpotomy in cases of pelvic abscess, and laparotomy and drainage in cases of peritonitis are, however, useful for the complications arising in cases of puerperal sepsis

COMPLICATIONS

Several complications may occur in the course of puerperal infection which may aggravate the condition. They must be carefully watched for, and when definite signs and symptoms are present suitable treatment should be adopted.

Among these complications may be mentioned —

- (1) General peritonitis
- (2) Pelvic cellulitis
- (3) Salpingitis and oophoritis
- (4) Pyæmic abscesses
- (5) Infection of the urinary tract
- (6) Phlebitis—phlegmasia alba dolens
- (7) Puerperal psychosis

Peritonitis

Infection of the general peritoneal cavity may occur at two stages in the course of puerperal infection —

- (1) Early in the disease on the second or third day
- (2) Late in the course of infection as a result of extension of pelvic peritonitis

The onset of peritonitis must be watched for carefully. It occurs on the second or third day after delivery, and the signs and symptoms vary so considerably that they may sometimes escape attention. In cases which develop the condition within the first three or four days after parturition the patient is nearly always already acutely ill with puerperal fever. The onset of peritonitis is marked by a change for the worse in the general condition. The onset in the early stages is insidious. A rigor may sometimes occur, the pulse is rapid, and its tension low, a certain amount of pain and vague discomfort may be felt in the region of the umbilicus, occasionally, a profuse diarrhoea may set in. The physical signs referable to the abdomen are few and difficult to interpret. Distension of the lower part of the abdomen is one of the earliest and most important sign. Gradually the distension increases until just before death the abdomen may be very tense. There is almost always tenderness particularly in the hypogastric and iliac regions. Rigidity of the abdomen is not usually present, and this sometimes accounts for failing to diagnose the condition. Signs of free fluid in the abdomen are

present in advanced cases but by the time these are found the prognosis is usually hopeless. Careful watch must be kept hour after hour, and the decision to operate must be taken at a very early stage before any pronounced physical signs or symptoms manifest themselves. Unless the patient is operated on within a few hours after the onset of peritonitis the prognosis is unfavourable.

Signs and Symptoms of Peritonitis developing at a Later Stage in the Puerperium In such cases the peritonitis develops several days after delivery and often there are local foci of suppuration in the pelvis. Clinical evidence will therefore be available of puerperal infection and involvement of some of the pelvic structures. Typically the onset of puerperal peritonitis is signalised by three symptoms—a rigor abdominal pain and greatly increased pulse rate. They form a characteristic triad whose importance can never be ignored. Abdominal pain usually accompanies the initial rigor and in almost every case it is severe, sometimes even agonising. The pain is continuous in character but sometimes it occurs in severe intermittent spasms causing the patient to suffer agonies. The initial pain may be referred to the umbilical or the hypogastric regions but as the infection spreads it becomes more generalised. The pain persists for two to three days with varying severity but later it assumes a stabbing character exacerbated by the slightest movement or by breathing.

Synchronously with the rigor the pulse rate rises to 120 or above and remains rapid even after the temperature has fallen. A persistently high pulse rate is one of the most significant of clinical signs. Respirations are increased in rate, the appetite is lost, vomiting is not a constant feature, the bowels are usually constipated but in some cases diarrhoea is an important early symptom. Painful micturition and not uncommonly actual retention of urine have been noted. The patient appears seriously ill and very soon after the onset of the condition the face wears an anxious expression, the eyes are sunken and the cheeks are hollow. She lies flat on her back or side with her legs drawn up and is quite still. The tongue is coated and later becomes dry. If the patient is examined after the initial rigor and the early pain rigidity can always be detected. Tenderness of the abdomen is generally noticed, the most tender regions being the hypogastric and iliac regions. Together with tenderness there may be distension of the abdomen. *Per vaginam* tenderness of the pouch of Douglas may be elicited.

Diagnosis It is very important to make an early diagnosis of this condition but unfortunately neither the signs nor symptoms are definite. A gradual but persistent or sudden change for the worse in the general condition of the patient, a pulse rate over 100, diarrhoea, progressive distension of the abdomen, abdominal signs,

and tenderness whether generalised or local and rigidity of the abdominal wall are all signs to be taken into account in arriving at a diagnosis. Occasionally mistakes are made, but it is preferable to err on the safe side than to neglect taking active measures till the condition has manifested itself so definitely that little can be done at that stage to relieve the patient.

Treatment It is now generally recognised that the proper treatment for general puerperal peritonitis is to operate. The points to be taken into consideration are —

- (1) The time to operate
- (2) The anæsthetic
- (3) The nature of the operation
- (4) Treatment of the causative factors responsible
- (5) Accessory treatment

The Time to Operate As soon as a definite diagnosis has been made an immediate operation must be performed. While it is an advantage to perform it in an operating theatre, in the worst cases the patient need not be shifted and the operation can be done at the bedside.

This is in contrast to cases of localised pelvic peritonitis where to begin with the treatment should be on conservative lines, as frequently the inflammation will settle down, particularly if it is associated with a definite localised and palpable lesion, either in the uterine appendages or in the broad ligament. In these cases the obstetrician must always be on the watch for possible spread of the infection to the general peritoneal cavity when immediate

peritonitis an attempt may be made to remove such foci. Gangrenous or suppurating tubes and ovaries may have to be removed. It is better, however, in all such cases to limit the amount of interference to the minimum and mere drainage is more effective in the initial stages of the severer types of puerperal peritonitis leaving the septic focus responsible to be dealt with at a later stage.

The general condition of the patient should be improved, light nutritious diet given, careful nursing and efficient stimulant treatment with free evacuation of the bowels adopted. Glucose and brandy, chicken essence and fruit juice are beneficial.

Pelvic Cellulitis

Not infrequently pelvic cellulitis may occur as a complication in the course of puerperal infection. It may be acute, subacute or chronic.

In the acute cases complete rest, hot vaginal douches, sometimes hot bowel washes together with turpentine stupes or antiphlogistine applied to the lower abdomen may be useful. In the more chronic cases protein shock therapy is desirable. Skimmed milk or aolin intramuscularly 2 to 5 cc. three times a week may be useful. The condition must be closely watched and if there is any definite abscess formation it must be opened and drained. Usually this is done through the vaginal route. In some cases where the abscess points above Poupart's ligament an incision at the site where it points may be necessary. General supporting treatment to keep up the patient's strength must be adopted.

Salpingitis and Oophoritis

In the majority of cases where these complications develop rest, douches, tampons, etc. are sufficient to resolve the inflammation. Occasionally, however, a pyosalpinx or a tubo-ovarian abscess forms. Care must be taken to see that the inflammation is localised before active interference is attempted. As in most of these cases it is associated with inflammation of the pelvic cellular tissue the same treatment that has been suggested for pelvic cellulitis may have to be adopted. After some months if there is still definite evidence that the tubes are involved operative treatment may be necessary. This consists in opening the abdomen, separating the adhesions and removing the diseased tube.

We must here sound a note of warning against any active interference in cases of puerperal salpingitis at a stage when the infection has not yet definitely localised or become chronic. Removal of inflamed tubes and ovaries too soon after the acute phase is definitely contraindicated as the infection may spread

peritonitis an attempt may be made to remove such foci. Gangrenous or suppurating tubes and ovaries may have to be removed. It is better however in all such cases to limit the amount of interference to the minimum and mere drainage is more effective in the initial stages of the severer types of puerperal peritonitis leaving the septic focus responsible to be dealt with at a later stage.

The general condition of the patient should be improved light nutritious diet given careful nursing and efficient stimulant treatment with free evacuation of the bowels adopted. Glucose and brandy chicken essence and fruit juice are beneficial.

Pelvic Cellulitis

Not infrequently pelvic cellulitis may occur as a complication in the course of puerperal infection. It may be acute subacute or chronic.

In the acute cases complete rest hot vaginal douches sometimes hot bowel washes together with turpentine stupes or antiphlogistine applied to the lower abdomen may be useful. In the more chronic cases protein shock therapy is desirable. Skimmed milk or aolan intramuscularly 2 to 5 cc three times a week may be useful. The condition must be closely watched and if there is any definite abscess formation it must be opened and drained. Usually this is done through the vaginal route. In some cases where the abscess points above Poupart's ligament an incision at the site where it points may be necessary. General supporting treatment to keep up the patient's strength must be adopted.

Salpingitis and Oophoritis

In the majority of cases where these complications develop rest douches tampons etc are sufficient to resolve the inflammation. Occasionally however a pyosalpinx or a tubo ovarian abscess forms. Care must be taken to see that the inflammation is localised before active interference is attempted. As in most of these cases it is associated with inflammation of the pelvic cellular tissue the same treatment that has been suggested for pelvic cellulitis may have to be adopted. After some months if there is still definite evidence that the tubes are involved operative treatment may be necessary. This consists in opening the abdomen separating the adhesions and removing the diseased tube.

We must here sound a note of warning against any active interference in cases of puerperal salpingitis at a stage when the infection has not yet definitely localised or become chronic. Removal of inflamed tubes and ovaries too soon after the acute phase is definitely contraindicated as the infection may

and a virulent general peritonitis result. For this reason, even though there may be definite signs of adhesions, chronic salpingitis with a pyosalpinx or a tubo-ovarian abscess, we do not recommend early operative interference. Conservative methods of treatment should be adopted in the meanwhile: rest, douches, tampons, injections of skimmed milk or aolin and supporting treatment for the patient's general health are indicated.

Pyæmic Abscesses

These may develop in any situation, generally in the soft tissues or in the joints. Wherever possible the abscess should be opened and drained, and when an empyema or an abscess in the joint forms it should be aspirated. The patient's strength should be supported and if an autovaccine can be prepared and given it may be useful.

Urinary Infections

The urinary tract is sometimes affected. Very often it is due to *B. coli*. Cystitis, pyelitis and pyelonephritis may occur. It is important to realise that care should be taken in the emptying of the bladder, that catheterisation should be avoided as far as possible, and where necessary it should be limited to a minimum, and where there is any ulceration or laceration about the urethra particular care should be taken.

If in spite of this infection occurs, urinary antiseptics should be given. Alkaline diuretics or hexamine and acid phosphoric dilutum are indicated. Cylotropine intramuscularly has been found beneficial and in the more persistent cases preparations of mandelic acid may be given.

Not infrequently a woman who has had pyelitis during pregnancy suffers from a recurrence of the symptoms after delivery.

Phlegmasia Alba Dolens

This is the term applied to the condition where, as a result of thrombosis of the femoral and iliac veins there is œdema of the extremity, it is associated with fever and pain. The disease usually begins late in the puerperium generally after the eighth or tenth day. The initial symptom may be excessive pain in the extremity. The swelling is first noticed in the groin and upper thigh. Within a few hours or days the whole limb may be involved. Sometimes both limbs may be affected. Sometimes the phlegmasia is the result of extension of the cellulitis from the pelvis.

Treatment. Prophylactic treatment consists in avoiding all dangers of septic infection. The great danger of phlebitis and

thrombosis is embolism. The patient should be kept at absolute rest and the affected limb should be slightly elevated and immobilised between sand bags or pillows to prevent any pressure or movement. For the pain morphia may be necessary. Local applications are sometimes of benefit. The limb may be painted with pigment belladonna or ichthyol and glycerine covered with cotton wool and lightly bandaged. Particular care should be taken to see that bed sores do not develop. The bowels should be kept free but no active purgation is indicated. Good nursing is of great importance. The strength of the patient should be supported. Anaemia if present should be actively treated. The patient should be kept completely at rest for some weeks till the swelling has disappeared and the temperature has remained normal for two to three weeks. The patient may then be given a little more freedom being allowed at first to sit up in bed and then gradually to get about. Massage of the limb should never be undertaken. The risk lies in the possibility of displacement of the thrombus resulting in pulmonary embolism.

Reproductive Insanity

Mental disturbances of varying degrees are not uncommon during the course of pregnancy, labour, the puerperium and lactation. Some of the minor degrees of mental change have been referred to under the signs and symptoms of pregnancy. But it not occasionally happens that a pronounced psychosis develops during the reproductive period.

There are four stages at which this may occur —

(1) In some patients melancholia develops during pregnancy. It may occur either in the first trimester but more often appears in the third trimester of pregnancy. The stress and strain involved by pregnancy and especially the added mental distress of illegitimacy or more rarely when a posthumous offspring is expected may be responsible for mental derangement.

(2) During labour neurotic women in particular break down under the strain and develop *maniacal* symptoms. Transitory mental excitement almost amounting to mania is not infrequent at this stage.

(3) The most common period however for mental instability to be noted is during the puerperium. Early in the puerperium patients are more inclined to develop the *maniacal* forms of insanity while later on the melancholic type predominates. During an attack of mania homicidal tendencies particularly infanticidal may be observed whereas when melancholia develops suicide is not infrequent.

(4) Lactational insanity is more often of the melancholic type

It persists for a few months. Not infrequently a patient who has once had psychosis during pregnancy or the puerperium develops the same tendency at subsequent pregnancies and if child bearing is not prevented the patient may ultimately become permanently deranged.

Causes In addition to the causes mentioned above the commonest underlying *ætiological factors* are the toxæmias and infection. In fact in many cases of toxæmias of pregnancy particularly those followed by eclampsia some degree of psychosis invariably results. Fortunately the period of mania usually lasts for a short time only but in some it is more pronounced and of longer duration. In cases where septic complications follow, puerperal mania is not infrequent.

Apart from these two factors namely toxæmia and infection a few cases are of idiopathic origin. In some particularly the idiopathic type hereditary influence plays a part. Such need not necessarily be the more pronounced forms of insanity but varies from mere eccentricity to neurotic tendencies. In the psychosis that develops in septic cases excitement with hallucinations accompanied by physical movements and homicidal tendencies may be observed. Later the patient passes into a condition of mental depression during which suicidal proclivities dominate.

Signs and Symptoms Among the symptoms noted may be sleeplessness—which is an early symptom—restlessness incoherent talk delusions and hallucinations together with an excited look a tendency to discard clothes and a lack of the reserve that is generally observed in women. The maniacal symptoms may be so pronounced that the patient has to be controlled in bed by a delirium sheet. Usually the patient refuses food is dirty and unclean in her habits. Elevation of temperature may be noted, where a septic factor is responsible the temperature is primarily due to the infection but in others in the early stages of maniacal excitement temperatures varying between 99° and 101° are not infrequent. The pulse is also proportionately rapid the tongue may be dry and the patient may exhaust herself to a serious extent.

Prognosis On the whole the prognosis in puerperal psychosis is favourable. When mania occurs during labour and in eclampsia the outlook is much more favourable than in the other types recovery usually occurring within a few weeks. Recovery is much more prolonged in cases following infections and in about a third of these the woman may fail to regain her mental equilibrium. The period of convalescence may last from three to six months. Melancholia following pregnancy and occurring in the lactational period is more recalcitrant. The tendency for a recurrence in a subsequent pregnancy has already been mentioned. The mortality

is comparatively low unless the patient dies from the underlying complication such as infection or toxemia.

Treatment should be directed to the underlying cause and the mental condition. In cases of infection the immediate objective is to treat this. Administration of sedatives, careful nursing, liberal and nutritious diet chiefly in the form of fluids and suggestive therapy, are helpful. It is preferable to remove the patient for institutional treatment and relations and friends should not be allowed to visit her. The proper place for treating these cases in the early stages is a maternity institution. When the psychosis tends to be prolonged and the patient has recovered from all the effects of the puerperium, she can be transferred to the care of a psychiatrist.

APPENDIX I

TRANSFUSION

THE transfusion of blood from the vessels of a healthy subject to the veins of a patient suffering from loss or destruction of blood due to injury or disease has been practised for long but its great value as a life saving measure in suitable cases was realised only after the Great War

Indications

The indications for transfusion are —

(1) **Hæmorrhage and Shock.** The diminution of blood volume in shock and hæmorrhage may be combated by transfusion of blood or failing that by infusion with normal saline solution or better by a 6 per cent solution of gum acacia with 0.9 per cent sodium chloride. In pure shock though there is a diminution in the amount of circulating fluid the amount of hæmoglobin in the body remains unchanged hence it would appear that in this case the infusion of the gum acacia solution might be sufficient. In severe hæmorrhage however transfusion has the advantage not only of replacing the fluid that has been lost, but also the oxygen carrying red blood corpuscles.

Though infusion especially with the gum acacia solution is undoubtedly of very great value and has certain advantages it is generally agreed that blood transfusion is the more effective especially in severe and desperate cases. Thus blood transfusion is often of service in obstetric practice in the treatment of postpartum hæmorrhage and the severe loss of blood which may occur in cases of placenta previa and ruptured ectopic gestation as well as other cases of severe hæmorrhage.

Transfusion has also been employed in the treatment and prevention of shock after severe and prolonged surgical operations. It should be given towards the conclusion of the operation before the signs of shock are marked and should be combined with other prophylactic measures. *Where shock is already present it may be given before the operation as part of the preliminary treatment.*

The effect of transfusion of blood in patients suffering from acute anæmia secondary to hæmorrhage and shock is very striking and almost immediate. The colour rapidly improves, the pulse previously thready or even imperceptible quickly returns, its rate slows and its volume become more normal. Restlessness diminishes and the patient may have a natural sleep as her general condition improves. These good effects are often permanent. If there is a relapse a further transfusion may re-establish and even add to the benefit derived from the first.

(2) **Hæmophilia.** In this disease the coagulation time is greatly increased with the result that a hæmophilic patient may bleed profusely

from a trivial wound. In such cases transfusion has been employed with great success. Not only does the transfused blood replace that which has been lost but the effect of the transfused blood is to diminish the coagulation time possibly even to normal. Transfusion thus acts in controlling the hæmorrhage. A comparatively small transfusion 100 c.c. or so is sufficient to produce such a hæmostatic effect.

(3) **Melæna Neonatorum** In this disease severe hæmorrhage takes place from the bowel of the infant shortly after birth. Transfusion with mother's blood is the most effective form of treatment—only a small amount 50 to 100 c.c. is required.

(4) **Addison's Anæmia** With the exception of hæmorrhage and shock this is perhaps the most generally accepted indication for blood transfusion. Transfusion does not cure the disease but in a considerable proportion of cases it brings about a definite improvement which may last for some time. Not only are the extracorpuscles added to the circulation but the transfused blood has a stimulating effect on the patient's blood forming tissues with the result that there is a considerable increase in the number of red corpuscles and this may persist for some months. Transfusion should be employed before the condition of the patient has become too serious and as a rule should be tried as soon as it is clear that other methods of treatment are ceasing to be effective. A transfusion of not more than 500 c.c. should be given and this should be repeated at intervals of a few weeks. Reactions of more or less severity are not infrequently met with after transfusion for pernicious anæmia. It is a wise precaution always to test the serum of the patient against the corpuscles of the proposed donor by the direct method. The serum reactions are not infrequently abnormal and even the blood of a Group IV or universal donor whose corpuscles should not be agglutinated by the serum of any patient may be incompatible in a case of pernicious anæmia. It should always be a rule that the blood should be given slowly and cautiously and that at the first sign of any reaction the transfusion should be stopped. It is wise to give as an initial dose 100 to 200 c.c. of blood in the more severe cases.

The remarks about transfusion of blood in cases of Addisonian anæmia apply also to cases of severe anæmia in pregnancy due to other causes. Thus in the macrocytic anæmia of pregnancy transfusion is of value as also in the more severe forms of secondary anæmia.

Selection of a Blood Donor Certain precautions should be observed in choosing a suitable donor for transfusion. The following conditions should be satisfied—

(1) The donor should be free from any infective or constitutional disease which might be transmitted to the patient. To eliminate this possibility the medical history of the donor must be carefully investigated and he should also be examined for any physical signs of disease. The diseases that have been transmitted are malaria and syphilis. As regards the former a careful inquiry and microscopical examination of the blood will help to exclude its possibility. To exclude syphilis Wassermann and Kahn tests should be done and should be negative. The transmission of tuberculosis from an apparently healthy person with some quiescent lesion is extremely unlikely.

(2) The donor should be in a fit condition to stand the necessary loss of blood and should preferably possess large superficial veins

(3) The blood of the donor must be compatible with that of the patient that is it must mix with it without causing agglutination or hæmolysis

Blood Groups The importance of ensuring that there will be no harmful reaction between the blood of the donor and that of the patient need hardly be emphasised. When whole blood is injected intravenously into patients (blood transfusion) precautions must be taken to ensure that the offered red cells are compatible with the serum of the recipient. From the behaviour of their red cells under these circumstances it is found that people can be divided into four groups. When foreign red cells of an unsuitable nature (that is of the wrong group) are injected very serious symptoms and even death may ensue. The red cells are first agglutinated (that is clumped together) into masses of varying size which may occlude capillaries in different parts of the body. They then undergo hæmolysis and the liberated hæmoglobin is partly excreted in the urine and partly broken down to form bilirubin thus causing intense jaundice.

It is found that human beings fall into four groups when agglutination tests are performed. These are shown in the following table. The sign + signifies agglutination while — signifies no reaction —

Corpuscles	Serum			
	1	2	3	4
1	—	+	—	+
2	—	—	+	+
3	—	+	—	+
4	—	—	—	—

It will be noted that the corpuscles of Group IV are not agglutinated by the serum of any of the other groups and that the serum of Group I does not agglutinate the corpuscles of any of the other three groups. Hence those belonging to Group IV are sometimes known as universal donors and those belonging to Group I as universal recipients. Group II and Group III can only receive red cells from Group IV and their own group.

Method of Grouping If sera of Groups II and III are kept in stock, any red cells can be assigned to their respective group. Drops of the blood of the person to be tested are mixed with a drop of each of these sera and as shown in the table

Group I is agglutinated by Groups II and III
Group II by Group III
Group III by Group II
Group IV by neither Groups II nor III

This method is not however infallible as some cells behave irregularly as though they belonged to some unclassifiable group

(2) **Transfusion with Citrated Blood.** One hundred c c of a 2 per cent solution of sodium citrate in sterile water should be added to each 900 c c of blood, so that this volume contains 0.2 per cent of sodium citrate. In actual practice it is usual to use this amount of citrate for 750 c c. Before withdrawing the blood from the donor, he should be lying flat on a couch. A bandage is applied to the upper arm sufficiently tight to make the veins prominent. The skin over the surface is cleaned with soap and water and then ether. No antiseptic is used. The blood is withdrawn by a sharp straight needle which is lubricated with liquid paraffin and attached to a sterile lubricated rubber tube. This tube reaches the bottom of a graduated flask which contains a sufficient amount of sodium citrate solution at a temperature of 105° . As the blood enters the flask it is thoroughly mixed with the citrate solution by agitating with a sterile glass rod.

The citrated blood thus obtained can be transferred to the recipient by the open method or by the use of a syringe, or any of the special apparatus used for this purpose. The transfusion should be carried out slowly and the effect on the patient carefully watched. As a rule about twenty minutes should be taken to give 500 c c, but if the patient's condition be not satisfactory double this time may be taken.

Infusion

By this is meant the introduction of an isotonic solution of salt in water or some other substance which will mix with the blood or tissues of the patient without causing any damage. Infusion of saline solution acts by increasing the quantity of fluid in circulation and thus increases the blood pressure, giving the heart a greater volume of blood to force along the arteries. The indications for infusion are much the same as for transfusion.

Preparation of the Solution. Ordinary boiled tap water may be safely used. The solution should always be isotonic with the blood plasma.

The following solutions may be used —

(1) *Sodium Chloride Solution.* The strength is one and a half drachms of sodium chloride to a pint of water, or roughly one teaspoonful of salt to a pint of water. The solution is sterilised by boiling and should be at a temperature of 115° F when introduced.

(2) *Locke's solution*, which is a physiological solution isotonic with blood plasma. Its composition is as follows —

Sodium chloride	9 grms
Calcium chloride	0.024 grm
Potassium chloride	0.042 "
Sodium bicarbonate	0.01 "
Dextrose	0.1 "
Aqua	100 c c

(3) *Adrenalin Solution.* Adrenalin raises the blood pressure by causing constriction of the peripheral arteries when given either

subcutaneously or intravenously. An infusion of saline solution should be given to which adrenalin hydrochloride has been added in the proportion of 1 in 50 000.

(4) *Dextrose Solution* A 6 per cent solution of dextrose is theoretically isotonic with human blood plasma. The following solution may also be used —

Sodium chloride	70 grains
Potassium chloride	3½ "
Dextrose	9 "
Aqua distillata ad	4 drachms

The ingredients when dissolved are sterilised by boiling and when added to a pint of boiled tap water form an isotonic solution.

(5) *Gum-acacia Solution* Bayliss advocated the addition of gum acacia to saline solution. A 6 per cent solution of gum acacia in a 0.9 per cent solution of sodium chloride is employed. This gum solution may be regarded as the most satisfactory solution for infusion although it is definitely inferior to blood transfusion in bad cases. It is particularly useful in the treatment of hæmorrhage and shock.

There are three possible *methods of infusion* —

- (1) Directly into a vein
- (2) Subcutaneously
- (3) Into the bowel

The intravenous route is preferred in all serious cases.

APPENDIX II

ANÆSTHESIA AND ANALGESIA IN LABOUR

OF late the necessity for relieving the pains of child birth has been realised by obstetricians, and the occasional publicity given in the daily press to different methods adopted for relieving the pains of labour has produced an insistent demand for such alleviation from the mothers.

So far as *anæsthesia* is concerned it is required in the majority of obstetric operations both to relieve the woman of the pain of the operation and to help the obstetrician to perform the obstetric procedure with a greater amount of safety for the mother. The methods adopted in obstetric *anæsthesia* for the performance of operations will be dealt with later. But it is as well to point out that there are two considerations to be borne in mind —

- (1) That the *anæsthetic* should be a safe one for the pregnant woman and should not have any deleterious effect upon the fœtus.
- (2) That its use should not cause any complications postpartum such as atony of the uterus and severe hæmorrhage.

The several anæsthetics that can be employed will be discussed with regard to their advantages and disadvantages

The question of analgesia in labour is on a different footing. With the increased demands of society the need has arisen for the employment of a safe and certain method of analgesia which while it will relieve the woman of the actual suffering will not in any way affect the course of labour or the prognosis of the fœtus. A safe analgesic is one that will satisfy the following conditions —

- (1) It should completely relieve the patient of the suffering experienced during the course of labour
- (2) It should not interfere with the progress of labour i.e. with the force of uterine contractions or their frequency
- (3) It should not necessitate an increase in the possibility of artificial assistance during delivery
- (4) It should not in any manner jeopardise the condition of the fœtus *in utero*
- (5) The child should be born alive without any degree of asphyxia
- (6) There should be no increased risk of postpartum hæmorrhage
- (7) The process of involution during the puerperium should not be interfered with
- (8) There should be no increase in the risks of sepsis from any cause i.e. either because of the need for frequent vaginal examination or the need for interference

Could these conditions be fulfilled one would advocate the use of such an analgesic in every case and our labour rooms would be far more pleasant and comfortable for the patients and the attendant midwives and obstetricians

One other factor has also to be borne in mind. The ideal analgesic should be cheap easily administered and should not necessitate the presence of a medical attendant throughout the course of labour. Obstetrics has still to be largely in the hands of midwives as it is impossible for the majority of pregnant women to avail themselves of the help of an obstetrician. Such an ideal analgesic has yet to be discovered as it may be safely stated that at present there is no drug on the market which can fulfil all the conditions. It is hoped that with the increasing interest now evinced in the subject of analgesia in labour methods may yet be evolved which will go far to satisfy at least most of these requirements

Anæsthesia in Labour

The chief methods of anæsthesia employed in obstetric surgery are (1) general (2) spinal and (3) local

The *general anæsthetics* used are —

- (a) Chloroform
- (b) Ether
- (c) Nitrous oxide and oxygen

For *spinal anæsthesia* various preparations have been used, the common among them being stovain percaïne or plainocaine ethocaine and novocaine

For *local anæsthesia* infiltration with 0.5 per cent of novocaine or percaïne is usually employed

General Anæsthetics *Chloroform* still remains the most convenient anæsthetic for the majority of deliveries. It has been condemned in certain quarters but either alone or as a mixture with ether (C_2E_5) it has been used very largely in our practice with no untoward results. It is desirable to emphasise in this connection that in most operative obstetric deliveries the ideal should be to produce what we term "obstetric anæsthesia." This consists in producing a sufficient degree of anæsthesia to prevent the patient moving as it is quite unnecessary in most obstetric operations to produce a deeper degree of anæsthesia generally known as 'surgical anæsthesia.' The application of forceps, extraction of a breech, suturing of a lacerated perineum, episiotomy, and many of the minor obstetric operations do not require more than "obstetric anæsthesia." Here the patient is lightly under and the administration should be discontinued so that the patient gets over the effects of the anæsthesia as the delivery is being completed. In one condition at least it is necessary that the woman should be under surgical anæsthesia, *i.e.*, where the jaw is relaxed and the pupil moderately contracted. We insist upon this stage of anæsthesia wherever an intra uterine manipulation is needed particularly internal podalic version. In cases of prolonged labour, where the uterus is tonically contracted, it is necessary to supplement the action of chloroform or ether by a preliminary injection of morphia. This is to avoid the possibilities of rupturing the uterus in the course of such internal manipulations by promoting the maximum amount of relaxation of the uterine musculature.

Chloroform is also used as an analgesic in some maternity institutions. For this purpose capsules containing about 20 to 30 minims of chloroform are employed. They can be broken in a handkerchief and inhaled by the patient.

There are certain conditions however where chloroform is definitely contraindicated. In severe toxæmias by virtue of its deleterious action on the liver, chloroform is not a safe drug. It may also be unsuitable in conditions where diseases of the lungs or the heart are complicating pregnancy.

Ether may be given by the open method or mixed with chloroform. There is a tendency for bronchial catarrh and except in special cases it is not generally advocated.

Gas and Oxygen This is a safe anæsthetic and wherever available, such as in maternity institutions, should be used as a routine. It is especially indicated in cases of pregnancy toxæmia, or where repeated general anæsthetics are required during a labour.

Spinal Anæsthesia. This has been very largely used in recent years in obstetric practice. Spinal anæsthesia as a method of inducing anæsthesia in the area of the operation as well as affording good relaxation is well known in surgical and gynecological practice. Its

use, however, as a routine method in obstetric operative deliveries is not to be commended. In certain types of abdominal operative delivery it is an ideal anæsthetic. It is of great advantage because it produces efficient contractions and retractions of the uterus, diminishes the tendency for hæmorrhage, lessens the shock of the delivery, stimulates contraction of the intestines, while favouring complete relaxation of the abdominal muscles. For these reasons spinal anæsthesia has become very popular in the performance of Cæsarean section. Where the spinal anæsthesia has been successful no better anæsthetic could be desired. Unfortunately spinal anæsthesia has got one serious drawback—it occasionally produces a sudden and marked fall of blood pressure with serious collapse and even cessation of respiration, which sometimes ends fatally. Another complication noticed in some of our cases was that the patient developed generalised convulsions followed by a period of coma and it was with considerable difficulty that she was ultimately revived. In view of these complications, which we have witnessed not infrequently, we have definitely discarded the use of spinal anæsthesia in obstetrics nor do we regret it because of the uniformly good results we have obtained with other methods of anæsthesia.

Local Anæsthesia. This method is used both for major obstetric surgery such as Cæsarean section and for minor operations—episiotomy, repair of perineal tears and low forceps. A 0.5 per cent solution of novocaine or percame is infiltrated into the area after proper antiseptic precautions have been taken. The method requires a certain amount of practice and has been extensively used by DeLee and other American obstetricians. We have practised the local infiltration method in cases of low forceps and repair of perineal tears and found it quite satisfactory. This method is especially useful where operative delivery by the vaginal route is required in cases complicated by toxæmias of pregnancy.

Analgesia in Labour

The object of analgesia in labour has already been explained, and the conditions that must be fulfilled if a successful analgesic is to be of general use. Many analgesics have been tried with varying degrees of success. Among the first of these analgesics to be tried was a combination of scopolamine and morphine, more popularly known as 'twilight sleep'. This consists in administering to the patient an injection of $\frac{1}{8}$ to $\frac{1}{4}$ grain of morphia with $\frac{1}{16}$ grain of scopolamine. The patient should preferably be in an isolated room, darkened, with pledgets of cotton wool in the ears to prevent any noise or distraction. The first injection of morphia and scopolamine is given when uterine contractions are well established and the external os is beginning to dilate. A second dose of scopolamine, $\frac{1}{16}$ grain, is given half to one hour later, and depending upon the condition of the patient, scopolamine, $\frac{1}{16}$ grain may be repeated three or four times at intervals of from one to two hours. The morphia should not be repeated. The effect of this method of analgesia is to put the patient into a half somnolent condition so that when labour is completed she has no recollection

of the pains Occasionally a certain amount of mental excitement is to be noted The method is only partially successful and some patients become either highly excited or fail to respond and are quite alive to all that is going on and to the pains

Apart from the occasional unsuccessful results there are two chief drawbacks to the use of this method There is undoubtedly a definite prolongation of the second stage of labour necessitating more frequent examinations and an increased possibility of artificial assistance with the attendant risk of infection Secondly the foetal mortality is definitely increased and while a large proportion of the children are born in a condition of apnoea some of them are so deeply asphyxiated that they fail to respond to methods of resuscitation A word of caution is given if this analgesic is used Not only must the patient be under continuous observation by the nurse in charge and supervised carefully from time to time by the doctor but it is necessary to realise that morphia should never be used if the membranes have ruptured or the second stage of labour has been reached To obviate the harmful effects of this drug upon the foetus heroin hydrochloride and omnopon have been tried On the whole twilight sleep has limitations and cannot be advocated as a general method of analgesia

Chloral and Bromide Many patients in labour find some relief from the oral administration of chloral and bromide the usual dosage being 15 grams of chloral hydras with 10 grains each of the triple bromides potassium sodium and ammonium Syrupus chloral 30 to 40 minims may be given instead of chloral hydras This draught is particularly useful where the patient is having teasing ineffective pains associated with a certain amount of rigidity of the cervix or where early rupture of the membranes has taken place and the cervix is only one or two fingers dilated The draught may be repeated once or twice at intervals of from four to six hours In some of our cases we have given a certain amount of relief by the administration of chloral per rectum in doses of 60 to 90 grains Chloretone has also been used with similar effect, in doses of half a drachm

Barbituric Acid Preparations Among the common drugs used for analgesia are the different preparations of barbituric acid Barbiturates may be used alone or in combination with sedative drugs such as morphia or its various preparations or ether per rectum Among the many preparations that are used are —

Nembutal This is about the most commonly used of barbituric acid preparations It may be given either alone or in combination with scopolamine paraldehyde or rectal ether The object of these combinations is to promote a sedative effect Nembutal can be given in the early stages of labour The usual dose is between 5 and 7½ grains given orally An hour afterwards an injection of scopolamine $\frac{1}{16}$ grain or paraldehyde 6 to 8 drachms in olive oil (1½ oz) per rectum may be given The nembutal may be repeated if necessary in smaller doses of 1 to 1½ grains

Nembutal does cause a certain amount of excitement and occasionally the patients are very boisterous For this reason it is not generally safe in domiciliary practice It increases also the incidence of instrumental

APPENDIX III

POST NATAL CARE

REFERENCE has been made in previous chapters to the care of the woman during the antenatal period and during the period of labour and the puerperium. It is not yet sufficiently realised that a woman recently confined has to be observed for some months after child birth. Post natal care is important from two points of view —

- (1) There is no period at which a woman is more liable to develop intercurrent infections or fall a prey to various diseases as the post natal period when her general vitality may be at a low level
- (2) A woman after child birth is never the same as she was before and the extent of any damage which has been caused by parturition has to be carefully assessed with a view to adopting suitable remedial measures both for immediate and permanent relief

The expression 'the gynecology of obstetrics' has come to stay because a careful examination of many patients during the post natal period and of patients who seek advice at the gynecological out patient department of hospitals has revealed the fact that many minor gynecological ailments are in reality the result of obstetric trauma which has been neglected. Some of the after effects of pregnancy and parturition manifest themselves during the later weeks of the post natal period and if suitable treatment is not adopted at this stage they tend to develop and give rise to other complications. Such effects may be due to the toxemias of pregnancy, the anæmias, late effects of septic complications and complications that are peculiar to the post natal period.

In view of what has been stated above it will be obvious that the organisation of a post natal out patient clinic is an essential in every lying in hospital and it should be a matter of routine to subject every woman to periodic post natal examinations to ascertain and if necessary treat any damage that has resulted from the delivery.

First Post-natal Examination This examination should be conducted at the end of the lying in period generally ten to fourteen days after delivery before the patient is actually discharged from the hospital. The points that have to be investigated are —

- (1) Her general condition in particular whether she is anæmic the condition of her breasts her gait, etc
- (2) The state of the abdominal walls
- (3) Condition of the perineum and, if sutures have been applied, whether the perineum is completely healed
- (4) The presence or absence of any lochial discharge
- (5) The condition of the vaginal walls
- (6) The condition of the cervix whether there are any lacerations or evidence of superadded inflammation

- (7) The position and condition of the uterus, in particular, whether it has involuted properly and whether there is any degree of displacement, backward or lateral
- (8) The condition of the uterine appendages
- (9) The condition of the parametrium, and in particular whether there is any tenderness or sign of inflammation of the pelvic cellular tissue
- (10) The condition of the urethra and bladder

At this stage in a normal case the uterus has again become a pelvic organ and is in the position of slight anteversion and antelexion, there should be no sign of inflammation of the tubes or the parametrium, and although the vagina is slightly relaxed, the perineum must be intact and there should be no cervical laceration or ulceration. The urine should be clear and contain no albumin or show any sign of infection of the urinary tract. Under such conditions the patient should be advised about the after care with regard to diet, regulation of the bowels, the amount of exercise to be taken, and directed to come for a second examination at the post natal clinic after an interval of six to eight weeks.

The Second Post-natal Examination This is conducted at the end of the puerperium six to eight weeks after delivery, and at this examination it is possible to come to a more definite conclusion as to the extent of any damage that has resulted from pregnancy and parturition. A systematic examination of the patient is essential at this stage. Her general health, the condition of her bladder, bowels and genitalia should be noted. A record should be maintained for future reference.

The examination includes the following —

Blood Pressure It is desirable to record the blood pressure, as in some cases of toxæmia of pregnancy or essential hypertension the blood pressure may continue to be high and may later give rise to other complications.

Hæmatological Examination The importance of this examination, particularly in the tropics, need not be emphasised again. In many cases varying degrees of anæmia have been noted at the post natal clinic, and if proper treatment is not adopted this may be followed by various superadded complications, such as diarrhoea, dysentery, chronic ill health, neuritis, puerperal ascites, etc.

The condition of the *abdominal wall* should also be ascertained. It is remarkable how in some cases after even one delivery the abdominal wall becomes very much relaxed, with extensive discoloration due to pigmentation, leading later to symptoms almost akin to those of visceroptosis. The exact causation of this extraordinary weakness has not been ascertained, but it is possible that it is due to factors such as endocrine deficiency.

A careful examination of the *genitalia* should be made.

The *perineum* should be examined to note whether it is intact or whether, if sutured, it has healed properly. It is important to realise that sometimes, although the perineum is apparently intact, in reality it is not so. Only the skin may have united, leaving a big gap in the

deeper structures so creating a deficiency in the pelvic floor which at a later stage will predispose to prolapse. If the perineum has not united or if there are healed lacerations, the condition of the anal sphincter should always be ascertained.

The *vaginal wall* should be carefully examined for the presence of ulceration or scars. It occasionally happens that near the fornices the vagina is lacerated and does not heal. Any tendency for cystocele or rectocele should be noted as also the presence of any fistula.

The Cervix It is most important that the cervix should be properly examined. It is therefore desirable to use a speculum. Lacerations of the cervix and infections give rise to many minor gynaecological complaints which result in chronic ill health. Cervicitis may later give rise to an erosion with chronic leucorrhœa and be a precursor to malignant ulceration. The infection may also spread upwards to the uterine cavity, thus giving rise to endometritis or in some cases it spreads into the general circulation, and causes complications such as myositis and rheumatoid arthritis, etc.

Uterus The condition of the uterus its size its position the presence or absence of any adhesions the condition of the uterine *adnexa* and of the *pelvic cellular tissue* should also be carefully noted. Not infrequently the uterus is retroverted or retroflexed. Subinvolution may persist, so that the uterus is much bigger than it ought to be. Tenderness if noted may be due to inflammation of the uterus or of the pelvic cellular tissue or of the *adnexa*. The tubes are sometimes easily palpable if they have been the seat of inflammation.

Exercises

If the patient is fairly normal and there is no evidence of any abnormality, she should be advised to carry out certain exercises during the puerperium and the post natal period. They are calculated to promote the restoration and proper maintenance of the tonus of the abdominal muscles to encourage the full movements of the diaphragm and give exercise to the muscles of the lower extremities and the perineum thus preventing any undue laxity of its musculature. An additional and most beneficial aid is massage. Apart from these exercises the patient should be advised to have regular outdoor exercises which in these early stages may consist of short walks morning and evening.

The diet should be fairly liberal and nutritious care being taken to avoid all irritative or over rich foodstuffs.

The patient should generally be advised to seek a further consultation after a period ranging from three to six months, a definite date usually being given so as to emphasise the need for this consultation. We believe that every case should be kept under observation for a period of one year at least, and that the patient should have opportunities of visiting the post natal clinic at intervals of from two to three months. At this visit and during every subsequent visit the patient should be encouraged to bring the child with her, so that it can be attended to at an infant welfare clinic attached to the post natal clinic. Here the mother is advised as to the proper method of feeding the intervals, the

proper care of the breasts and such other advice as is necessary for the proper care of the baby

We shall now refer in detail to some of the complications of the post-natal period and the methods of treatment to be adopted

Complications met with at the First Post-natal Examination

Lacerated Perineum The question of secondary repair of a lacerated perineum may arise at this period. In some cases the perineum does not heal satisfactorily and it may be possible to freshen the edges and put in secondary sutures. Wherever there is a reasonable possibility of healing and the wound edges are clean this may be done. If, however, the area is infected or is bruised it is advisable to instruct the woman to have the parts cleaned after micturition and defecation with antiseptic douches or washes. She should be further directed to attend the post natal clinic at the third month after confinement.

The sequelæ of events following an unrepaired laceration of the perineum are rectocele, cystocele, prolapse of the uterus, incontinence of motions, general weakness of the pelvic floor, persistence of some degree of infection with resulting general constitutional debility. Hence the importance of ensuring an efficient perineum after delivery.

Lacerations of the Vagina In most cases they tend to heal spontaneously with proper antiseptic care. Where such lacerations persist the woman should be advised to attend the post natal clinic, have daily vaginal douches and the parts touched if necessary, with antiseptics, such as mercurochrome, acriflavine, alcoholic solution of picric acid or other mild antiseptics.

Lacerations of the Cervix When these are met with it is better to treat them in the first instance with antiseptics so as to keep the edges clean. We consider that the proper time to repair these lacerations is after the third month after delivery. The patient should be warned that if the lacerations are allowed to persist they may lead to chronic cervicitis, erosion of the cervix and favour the development of malignant ulceration at a later stage. Apart from these considerations where the cervix is badly lacerated the possibilities of subsequent abortion or premature labour should be borne in mind. Neglected lacerations are also likely to lead to an ascending infection, involving the uterus, Fallopian tubes, ovaries and the pelvic cellular tissue.

Displacements of the Uterus By far the commonest of the complications that may be met with at this period is retroversion or retroflexion of the uterus. This often happens with a subinvolved uterus, or in cases where the uterus has been the seat of infection. It is necessary to rectify the displacement, and it is here that a suitable pessary will be found of great use. A Smith Hodge's pessary can be introduced after the uterus has been brought to the correct position manually and kept *in situ* for six to eight weeks. The patient should be given the necessary advice about the necessity for a daily vaginal douche and warned of the dangers of leaving a pessary in the vagina indefinitely. Suitable measures ought also to be taken simultaneously to treat subinvolution if it is present.

Subinvolution of the Uterus This is not infrequently met with and in a large number of cases is due to some degree of infection. Apart from this it is seen in multipare and in women who have had other complications after delivery. To promote proper contraction and retraction of the uterus and to favour the expulsion of any discharges from the cavity the patient should be given hot vaginal douches twice or thrice a day and ecbolics such as ergot, hydrastis, etc.

Inflammation of the Adnexa Where there has been some degree of uterine or cervical sepsis the tubes and ovaries may become the seat of inflammation. It is necessary to realise that the treatment should be on conservative lines. Hot vaginal douches, ichthyol and glycerine tampons (10 per cent. solution) and poultices to the lower part of the abdomen may be used. In cases where the inflammation is tending to be chronic protein shock therapy will be found beneficial. Injections of defatted sterilised milk may be given. The patient must have rest and suitable nourishment, the bowels regulated and if specific organisms are isolated suitable vaccine therapy must also be given.

The Care of the Breasts It is necessary to examine the breasts and to note any abnormalities of the nipple or the lactating breast. The details with regard to this are dealt with in the chapter on the care of the new born.

General Advice We have referred to this earlier in the chapter but it may be reiterated that the patient should be given definite instructions as to diet, care of the bowels and bladder, exercise, proper mental and physical rest and care in lactation. It is as well to give her a definite post natal programme so that she may chart her progress and make a note of any special points during the eight to twelve weeks before her second visit to the post natal clinic.

Advice at the Second Post-natal Examination

At the second visit to the post natal clinic a thorough general and pelvic examination should be made and any abnormalities noted. If the patient has taken all the precautions advised previously there should be few abnormalities noted at this examination. If any such abnormalities are noted they should be corrected.

Proper suturing of the perineum and repair of the cervix are essential. We have referred to the part these play in the causation of gynaecological complaints at a later stage.

We emphasise the need for a haematological examination for the recording of the blood pressure for a thorough examination of the urine and for noting the presence of any adnexal inflammation. It is also well to enquire into any disabilities in regard to walking, muscular activity, physical activity, etc. Not infrequently have we noticed a tendency for a mild form of decalcification associated with pain in the joints and bones and weakness in the muscles. Calcium therapy is indicated in such cases. Proper exercises for the muscles of the abdomen and of the perineum should be emphasised as already stated. If the general health of the patient is fair she may be given suitable advice.

and asked to report herself at intervals of three to four months at the post natal clinic

We shall now refer to some more general pathological conditions that may supervene during the post natal period

Puerperal Neuritis

Neuritis is a troublesome complication that may occur in the post-natal period. It may be of two kinds—traumatic or peripheral

Traumatic neuritis is not uncommon, especially where labour has been prolonged or delivery assisted. The application of forceps in an occipito posterior position or in moderate degrees of cephalo pelvic disproportion, or the extraction of a breech may be followed by traumatic neuritis. The patient generally complains of pain coming on a few days after delivery. There may be tenderness along the course of nerves, particularly the sciatic, in some cases there may be numbness, a feeling of "pins and needles" and even inability to move the lower extremity. The pain may sometimes be excruciating. Prevention of such an injury is difficult. Where there is a history of previous severe neuritis, very careful examination should be made as to the possibilities of delivery through the natural passages without maternal damage, and as an alternative a Cæsarean section may have to be considered. In primiparæ with slight cephalo pelvic disproportion, care should be taken in the application of forceps and in the force that is utilised in the extraction of the head.

Treatment consists in giving the affected part complete rest, the extremities should be immobilised by sandbags on either side, and if necessary a posterior splint may be used. The parts must be kept warm, pain relieved by sedatives, and at a later stage gentle massage and passive movements encouraged.

Peripheral neuritis is a complication that occurs occasionally during the puerperium. There is a flaccid paralysis of both lower extremities and the distal portions of the limbs are most affected. Hyperæsthesia of the skin and tenderness of the muscles may be marked. The condition lasts for several weeks and the patient is unable to move about. It is not infrequently associated with anæmia and occurs in patients who show other signs of vitamin deficiency. Deficiency of calcium has also been noted. In some cases there is a tendency for recurrence of this condition in subsequent pregnancies and puerperia.

Treatment consists in absolute rest in bed, nourishing diet, vitamin therapy particularly in the shape of cod liver oil and preparations rich in vitamin B. Later in the course of the disease gentle massage to keep up the tonicity of the muscles and mild passive movements are necessary.

Puerperal Ascites

This rare condition has occurred at all ages of the child bearing period. Young women of twenty to twenty five years after their first confinement have developed ascites in the puerperium, and a careful investigation of the ætiological factors concerned has failed to reveal

any pathological condition associated with the heart, liver or the kidneys. It would appear as if these cases also are due to some nutritional deficiency. They are very resistant to treatment and the patient becomes progressively worse. The condition requires further investigation.

In those cases of ascites occurring in the puerperium due to other causes such as heart lesions or ankylostomiasis treatment of the causative factor generally results in an improvement and the ascitic condition clears up.

Chronic Enteritis

During the post natal period inflammations of the gastro intestinal tract are by no means infrequent. In some cases this may be due to pathogenic organisms. The different forms of dysentery amoebic and bacillary, especially in tropical climates are frequent both during the puerperium and the post natal period. Diarrhoea from other causes is also not infrequent. At this period however a special form of chronic enteritis develops resulting in a severe type of anaemia wasting ulceration of the tongue sprue like diarrhoea and a dry inelastic skin. If the condition is neglected the patient gradually and progressively weakens and dies. Examination of the motions does not reveal the presence of any parasites. A haematological examination may reveal the presence of a severe type of secondary anaemia more often of the microcytic hypochromic variety.

The prognosis in these conditions is not unfavourable if the patient is treated sufficiently early. In neglected cases however the prognosis becomes grave and if associated with other pathological conditions such as nephritis or myocarditis the outlook is serious.

Treatment The patient should be given complete rest and at the early stages of the treatment the diet should be limited to fluids. Fruit juice, glucose, conjees and liver soup may be ordered. After a preliminary mild laxative the patient should be put on intestinal antiseptics and astringents. Simultaneously with this the patient should be given large doses of iron—ferri et ammonium citras 60 to 90 grams per day—and cod liver oil. In some cases preparations of vitamin B are very useful. Raw liver juice is also indicated if it can be tolerated. In more urgent cases one of the well known liver extract preparations should be given intramuscularly.

Hemiplegia may be of the right or left side. It may be a complete hemiplegia more often on the left side or occasionally it may be a monoplegia. Crossed hemiplegia has also been noted. The attack is sudden and is followed by a flaccid paralysis of the extremities on one side which later undergoes the usual spastic changes in hemiplegia.

The prognosis depends upon the extent of the involvement and the size of the vessel affected and upon the immediate pathological changes which occur in the obstructed vessel. Fortunately it is sometimes of a transient nature and the effects disappear quickly. In others again it is more severe and chances of recovery are remote.

Treatment should be directed on the usual lines for cases of hemiplegia.

APPENDIX IV

ENDOCRINOLOGY IN OBSTETRICS

RECENT work has made it clear that various hormones have a large share in the physiological changes characteristic of pregnancy, labour and lactation. While there is yet much to be investigated before definite conclusions are reached with regard to the part played by the endocrines in pregnancy, experimental work and clinical observations have given us an idea of the role of the different endocrine glands in pregnancy. The chief endocrine glands are —

- | | |
|---------------------------|------------------|
| (1) The pituitary | (5) The thymus |
| (2) The thyroid | (6) The placenta |
| (3) The parathyroids | (7) The ovaries |
| (4) The suprarenal glands | |

It is possible that further investigation may throw light upon some of the other accessory endocrine glands and the part they play alone or in combination with other endocrine glands.

The Pituitary Gland This consists of an anterior lobe and a posterior lobe and an intermediary or connecting lobe. The anterior and posterior lobes of the gland are of different origin and possess different functions.

The Anterior Pituitary The anterior lobe is responsible for several hormones among which may be mentioned —

- (1) Prolan A which causes maturation of the follicles of the ovary
- (2) Prolan B which causes luteinisation of the follicles
- (3) A growth stimulating hormone
- (4) A hormone that activates the breast
- (5) A thyrotropic hormone which activates the thyroid tissue

The two gonadotropic hormones, prolan A and prolan B, are concerned in bringing about ovarian response. Prolan A stimulates the secretion of oestrin while Prolan B, as has been stated, causes luteinisation of the granulosa cells and forms the corpus luteum. During pregnancy the activity of the anterior pituitary increases and the hormones are

secreted in the urine of the pregnant woman. The detection of these hormones in the urine of pregnant women through animal experiments constitutes the Aschheim Zondek test.

The Posterior Pituitary The posterior lobe of the pituitary produces three different hormones (1) a hormone that stimulates the uterus (2) a hormone that raises the blood pressure and (3) an antidiuretic hormone. It would appear that both the anterior and posterior lobes act in a sense in opposite directions during the course of pregnancy keeping up a balance in favour of the anterior pituitary during the continuance of pregnancy while at the time of labour the posterior pituitary becomes more dominant.

The anterior lobe is itself under the influence of certain hormones which are secreted during the course of pregnancy. Thus the chorionic hormones are possibly responsible for influencing both the anterior and posterior lobes acting as depressors throughout pregnancy and inhibiting the production of follicle stimulating and prolactin hormones of the anterior lobe and the oxytocic principle (pitocin) of the posterior lobe. In this effort another hormone progesterin which is secreted by the corpus luteum and probably also by the placenta helps to maintain relaxation of the uterine muscle. Progesterin gradually diminishes in quantity after the sixth month thus favouring progressive return of irritability of the uterine muscle culminating in the strong labour pains that develop at term. The oestrin that is secreted throughout pregnancy is responsible for stimulating the growth of the breast. At or near term oestrin increases the irritability of the uterine muscle which favours the action of oxytocin or pitocin secreted by the posterior lobe and thus causes contraction of the uterus and the onset of labour. This is made possible by the gradual cessation of the production of progesterin due to the degeneration of the corpus luteum. We thus see that the hormones of the pituitary gland act in close association with the hormones of the ovary and the placenta and any deficiency in any of the hormones in this chain may possibly result in pathological changes during pregnancy.

The Thyroid It is well known that during pregnancy the thyroid gland undergoes some hypertrophy and increased activity is to be noted throughout gestation. Animal experiments have demonstrated that removal of the gland prolongs the period of pregnancy. It would appear that the general well being of the pregnant woman together with the increase in weight is in some cases due to thyroid hypertrophy.

The Parathyroids These glands have also been noted to enlarge and to become increasingly vascular. Dysfunction of the parathyroid brings about hypocalcaemia a condition that is not infrequent in the pregnant woman. It may also give rise to undue irritability of the nervous system and of the muscular tissue occasionally ending in abortion or premature labour.

The Suprarenal Glands These glands undergo hyperplastic changes notably in the cortical area. The hormone secreted by these glands has the following functions (1) a general detoxicating action (2) maintenance of hypercholesterolemia of pregnancy (3) possibly the pigmentary changes characteristic of pregnancy are due to this hormone and (4) a

mild glycosuria in pregnancy may be the result of this slight hyperadrenalæmia

The Thymus Under normal circumstances the thymus gland atrophies during adolescence and should be practically non-existent at the time of pregnancy. Sometimes a persistent thymus may be present. Such cases are of importance as under chloroform anaesthesia sudden deaths have been reported in such cases.

The Placenta It has already been stated that the placenta is probably responsible for a hormone which has got considerable influence over the other endocrine hormones. The placental hormones stimulate (1) uterine hypertrophy (2) hypertrophy of the thyroid and hypophysis and (3) the growth of the mammary tissue.

The Ovaries Recent experiments have completely demonstrated the fact that the ovary with the corpus luteum which forms in the early stages of pregnancy is necessary only in the early part of pregnancy that is during the first trimester. The corpus luteum (1) inhibits further ovulation (2) it helps in the formation of a healthy decidua membrane whereby implantation and development of the fertilised ovum is rendered possible (3) by inhibiting premature uterine contractions it allows gestation to proceed to term and (4) it also influences the development of the breasts.

Endocrine Therapy in Obstetrics

Except for the posterior lobe pituitary extract the results of endocrine therapy in obstetrics are on the whole disappointing.

Œstrin administration is rarely successful in induction of abortion though it has been found more effective in (a) induction after missed labour. This method of terminating a case after missed labour is no doubt much safer than by operative interference. (b) Œstrin has also been successfully utilised in some cases of uterine inertia.

Corpus luteum extract has been used with satisfactory results in (a) some cases of habitual abortion (b) in some cases of threatened abortion and also in cases of (c) hyperemesis gravidarum of moderate severity.

Thyroid extract was employed until recently in cases of eclampsia and pre-eclamptic toxæmia with variable results. It has receded into the background since the more rational treatment described by Stroganoff has been popularised.

Posterior Lobe Pituitary Extract This is without question the most potent endocrinological product in our obstetric armamentarium. Its main function is oxytocic i.e. uterine stimulant.

(a) It is used extensively in hæmorrhages of pregnancy and labour. In the antepartum type of hæmorrhage usually small doses of pituitary extract about $\frac{1}{2}$ to $\frac{1}{4}$ c.c. i.e. two to three units are employed. For the postpartum variety larger doses from 1 to 1 c.c. frequently in combination with ergotin $\frac{1}{2}$ to 1 c.c. are given to produce efficient contraction and retraction of the uterus so as to stop the hæmorrhage.

(b) It has also been used in cases of inertia of the uterus in small doses $\frac{1}{2}$ to $\frac{1}{4}$ c.c. particularly in the terminal second stage of labour.

Pituitary extract thus administered can obviate the necessity for forceps application. It is not to be thought of, however, when there is any disproportion or when evidences of foetal distress such as a big caput are already manifest.

(c) It can also be used with success for puerperal uteri which show a tendency towards subinvolution. It can with advantage be combined with hot vaginal douches and ergotin.

(d) It is also a drug that is frequently employed in the medicinal method of induction of labour. It is here used in conjunction with castor oil, an enema and quinine. It is to be administered in fractional doses of $\frac{1}{2}$ to $\frac{1}{4}$ c.c. by either the subcutaneous route or as is sometimes advised by nasal application on a pledget of cotton wool.

(e) Pituitary extract is also invaluable in relieving post-operative distension particularly after *Cæsarean section*. It is administered with the double object in view of augmenting intestinal peristalsis as well as speeding up uterine involution which is usually sluggish after a *Cæsarean section*.

INDEX

- Abderhalden 52
- Abdominal hysterotomy in induction of
 - abortion, 733 4
 - modes of delivery in contracted pelvis, 558 9
 - pregnancy, 335 46
 - primary, secondary and tertiary, 335 6
 - prognosis of, 339 40
 - treatment of, 340 6
 - wall, during puerperium, 127
 - in pregnancy, 28
- Abortion, 303 *et seq*
 - acute specific fevers in, 303 4
 - causes of, 303 6
 - cervical, 308 312 317
 - complete, 307
 - complications in, 318
 - criminal 309
 - differential diagnosis from certain con-
ditions, 310 11
 - extra uterine pregnancy, 310 11
 - vesicular mole, 311
 - displacements of uterus in, 304
 - febrile, 309, 317
 - fœtal causes of 305
- Amenorrhœa atypical in tubal pregnancy 330
 - in pregnancy 33
- Amnio embryonic vesicle, 20
- Amniography, 57
- Amnion, 21
 - diseases of 282
- Ampulla of tube 14
- Ampullary pregnancy 326 7
- Amytal in labour 794
- Anæmia pernicious in pregnancy 247
242 8
- Anæmias in pregnancy 238 50
 - secondary during pregnancy 249 50
- Anæsthesia and analgesia in labour 789 94
- Anæsthetics in obstetric operations 647
- Analgesia (in labour) Gwatkin's method
of 794
- Anencephalus 208
- Ankylostoma duodenale 234
- Anselmino 168
- Antenatal care 72 *et seq*
 - clinic, 73 4
 - advice given at 80
- Anterior fontanelle presentation
222 80

- Beyrout's method of exteriorisation of the uterus, 269
 Biliary colic in pregnancy, 273
 Binder, use of, during puerperium, 129
 Birth "corpore conduplicato" 438
 Blackwater fever in pregnancy, 227 8
 Bladder, care of, during puerperium, 132
 in retroversion of uterus, 493-4, 495, 501
 Bonney, 505
 Bougies introduction of, in induction of labour, 739
 Brachial palsy, 631
 Brain in eclampsia, 169
 Braun 690
 Braxton Hicks method of bipolar version in placenta prævia, 369 70
 sign 39 41
 Breasts care of 82 133 799
 changes in during pregnancy 30, 35
 during the puerperium, 126
 inflammatory affections of, 637 9
 Breast feeding 137
 contraindications for, 138
 Breech deliveries, foetal injuries in, 434
 Breech presentations 186, 411 *et seq*
 complications in, 423
 differentiated from other varieties,
- Cæsarean section, technique in, 702
 time for operation, 701
 uterine forces in, 700
 vaginal, 719 23
 Calcium deficiency of, during pregnancy, 32
 Caldwell and Moloy's classification of pelvis, 563
 Cancer of cervix complicating pregnancy, 528
 Caput succedaneum, 96, 628 30
 Cardiac lesions, induction of labour in cases with, 736
 Cardinal ligaments 12
 Carrel Dakin treatment of puerperal infection, 770
 Caruncule myrtiformes 46
 Cephalhæmatoma, 628 30
 Cephalometry, 58
 Cephalotripsy, 689
 Cerebral malaria simulating eclamptic attack, 172
 Cervix, anatomy of, 11
 abnormalities of, 486 90
 cancer of, complicating pregnancy, 528
 changes in, during the puerperium, 126
 dilatation of, during labour. *See* 90

- Conjugates, 2
 Contraception in heart disease, 206
 Contracted pelvis, 530 *et seq*
 abdominal modes of delivery in, 538 9
 Caesarean section in, 551, 558 9
 classification of, 531 4
 course of pregnancy and labour in, 544 *et seq*
 diagnosis of, 534 6
 during labour, 545-7
 exaggerated lithotomy position in, 557
 forceps in, 551 5
 frequency, 534
 induction of abortion in, 534
 induction of labour for, 551 4, 735 6
 management of labour in, 548 *et seq*
 in different degrees of, 560 2
 pelvimetry in, 537 44
 postural methods, 556 7
 prognosis of labour in, 547 8
 radiographic examination in, 544
 special forms of, 564 *et seq*
 spontaneous delivery in, 549 50
 test labour in, 550 1
 version in, 555 6
 Cornua, uterine, 15
 Corpus luteum, 18
 extract, 804
 of menstruation, 18
 of pregnancy, 18
 Cortex of ovary, 14
 Cranioclast, 688 *See* Craniotomy
 Cranioclast and cephalotribe, combined, 690
 Craniotomy, 691 8
 Credé's manoeuvre, 588
 method of expression of the placenta, 119, 221
 Crewe, 54
 "Crowning of the head," 91
 Curettage in puerperal infection, 770 1
 Curtis, 505
 Cyst, ovarian, twisting of, 338
 Cystocele and rectocele, complicating pregnancy, 509
 Cytoplasm, 19
 Cytotrophoblast, 20

 Das, Sir Kedarnath, 648
 Decapitation, 447 8, 690 2
 extraction after, 692
 technique in, 690
 Deficiency diseases in pregnancy, 266 9
 De Lee, 358, 376, 505, 664, 718
 Delivery, abdominal modes of, in
 contracted pelvis, 538 9
 Diabetes in pregnancy, 259 61
 induction of labour for, 738
 Diameters of pelvis, 2
 Diet in pregnancy, 80
 Dietary alterations causing eclampsia, 168
 Digits, supernumerary, 636
 Dilators, Matthews Duncan's, 316
 Hegar's, 316, 740
 Diphtheria in pregnancy, 216
 Discus proligerus, 23
 Diverticulitis in pregnancy, 273 4
 Double monsters, 300 3
 Douglas' pouch, 325, 330, 331

 Ductus arteriosus, 24, 26
 venosus, 24, 26
 Dührssen, 454
 Dührssen's method for incision of cervix, 605
 Duncan, Matthews, 316, 537
 Dysenteries in pregnancy, 262 5
 Dysentery, amoebic, in pregnancy, 264 5
 bacillary, in pregnancy, 263 4
 Dystocia due to abnormalities of maternal
 soft parts, 482 *et seq*
 due to anomalies of the expulsive forces, 468 *et seq*
 due to faulty attitude 377
 in labour, 377 *et seq*

 Eclampsia, 160 168 *et seq*
 after case in, 189
 albuminuria in 174
 and Caesarean section, 700
 blood pressure in, 174 183
 cardiac failure in 189 9
 complications in 175
 foetal prognosis in, 175
 future pregnancy after, 192
 hyperpyrexia in 188
 intrapartum management of labour in, 186
 kidneys in 185, 192
 management of labour in 184 7
 mental disturbances in, 188
 oedema in 174
 prevention and treatment of complications in, 187
 prevention of fits in 182
 pulmonary complications in, 187
 septic complications 189
 termination of pregnancy in 184 5
 treatment of, 176 92
 Arnold and Fay's method 180
 Dublin method 178 80
 other methods 191 2
 radical, 190
 Stroganoff's 177
 types of cases, 175
 visual disturbances in 189
 Eclampsism, 161
 Eclamptic convulsion or fit, 169
 cerebral malaria simulating 172
 time of onset 170 1
 treatment during, 182
 Ectoderm, 21
 Ectopic gestation in later weeks of pregnancy, 344
 Ectopic pregnancy 319 *et seq* *See* Extra Uterine Pregnancy
 Embryo, development of 21
 Embryonic area differentiation of the, 20
 Endocrine disturbance causing eclampsia, 168
 Endocrine glands in pregnancy, 32
 Endocrinology in obstetrics, 802 5
 Endometrium, 11
 diseases of, cause of abruptio placentæ, 349
 Entamoeba histolytica, 263, 264
 Enteritis, chronic, 801
 Entoderm, 21
 Episiotomy, 112

- Gonorrhoea in pregnancy, 220 22
 Graafian follicles, 14
 fertilisation in, 320
 Granuloma inguinale in pregnancy, 222 3
 Greenhay, 718
 Gwathmey's method of analgesia, 794
- Hæmatological examination, methods of, 239-41
 Hæmatometra, 43
 Hæmophilia, blood transfusion in, 784 5
 Hæmorrhage accidental, Cæsarean section in, 700
 and shock, blood transfusion in, 784
 complications in, 360 1
 in abortion, 318
 in new born 149 50
 in pregnancy and labour, 348 *et seq*
 indications for Cæsarean section, 350 61
 induction of labour in 737
 mistaken for acute hydramnios 281
 postpartum, 579 *et seq*
 secondary, complicating rupture of uterus, 619
 severe or fulminant type of, 359
 Hall, Marshall, method of artificial respiration of, 624
 Harelip, 636
 Head of new born child, injuries to, 628 31
 Heart disease and marriage, 206
 and pregnancy, 196 7
 hypertrophy of, during pregnancy, 30
 muscle in eclampsia, 163
 Hebestotomy, 557
 Hegar's dilators 316, 740
 sign, 36 37, 41, 42, 330
 Helminthiasis in pregnancy, 233 7
 Hemiplegia, 801 2
 Hernia, amniotic 635 6
 into the umbilical cord, 635 6
 Higginson's syringe, 372
 Hilum of ovary, 14
 Hoffman, 168
 Hookworm disease *See* Helminthiasis
 Hour glass spasm of uterus, 479 81 *See also* Uterus
 Hydatidiform mole, 49, 274 80
 Aschheim Zondek Test in diagnosis of, 54
 Hydramnios, 49
 acute, in differential diagnosis of abruptio placenta, 353
 associated with anencephalus, 298
 complications in, 285
 hæmorrhage mistaken for, 284
 hydatidiform mole mistaken for, 278
 in pregnancy, 282 7
 in prolapse of the cord, 449
 induction of labour in, 737
 X ray examination in, 53
 Hydrocele and inguinal hernia, 637
 Hydrocephalus, 298 300
 Hydrothorax, 300
 Hymen, 10
 Hyperemesis gravidarum, 31, 34 73, 152 9
 treatment of, 165
 Hypothyroidism in pregnancy, 261
 Hysterectomy, Cæsarean, 519 559, 713 15
 Hysterotomy, abdominal 733 4
 vaginal, 733
- Icterus gravis, 146
 Icterus neonatorum 146
 Incarceration in ovarian cysts, 523
 Induction of labour in contracted pelvis, 551 4 *See* Labour, Induction of
 Infant, changes in circulation after birth 26
 premature care of 143
 Infantile beri beri in pregnancy, 232
 convulsions 146
 Infarct formation of placenta 291
 Influenza during pregnancy 212 4
 Infundibular pregnancy 327 9
 Infundibulum of tube 14
 Infusion, 788 9
 Insanity, reproductive 781 3
 Insufflation, 625
 Insulin in treatment of hyperemesis 107
 Interstitial diameter of pelvis 2
 Internal os 11
 Interspinous diameter of pelvis 2
 Interstitial portion of tube 14
 Inter trochanteric diameter of pelvis 2
 Intestinal obstruction in pregnancy 273
 toxins absorption of causing eclampsia, 167
 Intra peritoneal rupture in ampullary pregnancy, 327
 in isthmal pregnancy 325
 Intra uterine douche in puerperal infection 770
 swab, technique of taking 708 9
 Isthmus of tube 14
 Isthmus uteri 11
- Jacquemier's sign 35
 Jardine, 690
 Jaundice, catarrhal in new born 145
 in pregnancy, 160
 Jellett 505
 Jellett's classification of contracted pelvis 532 3
- Kahn Test 219 (bis)
 Kala azar in pregnancy 226 7
 Kidney in eclampsia, 169
 in pregnancy, 163
 Krause's method of induction of labour, 739
 of terminating pregnancy, 167 186
- Labia majora 8
 minora, 9
 Labour, accessory muscles of 90
 anæsthesia and analgesia in 789 94
 bed, 103
 causes of 85
 complicated by double monsters, 302 3
 by ovarian tumours 525 6
 control of hæmorrhage in 93
 definition of, 85
 delivery of the body in, 115
 of the shoulders in, 100 114
 descent with increased flexion in vertex presentation, 96

- Epithelium, germinal, 14, 18
 Ether in labour, 791
 Eutocia 37"
 Evisceration 693
 Exercise during pregnancy 81
 Exercises in post natal care, 797
 Exomphalos 451
 Expectant method of treatment in
 abdominal pregnancy, 343
 in placenta prævia 366
 External os 1"
 Extraperitoneal rupture in isthmal preg-
 nancy 3⁹⁶
 Extra uterine gestation 48 336-46
 differential diagnosis in retroverted
 gravid uterus, 496 7
 treatment of 340 6
 pregnancy *See also* Ectopic Pregnancy
 repeated 346 7
 \ ray examination in 56
 Extra uterine and intra uterine pregnan-
 cies combined, 347
- Fœtus developmental anomalies of 297
 303
 diagnosis of intra uterine death of, 51
 radiological 56
 diseases of 296 7
 effect of labour on in contracted pelvis,
 546 7
 excessive size of induction of labour for,
 738
 expulsion of, 91
 fixation of the head of 50
 habitual death of *in utero* induction of
 labour for 737
 hydrocephalus of 294-300
 he of 59
 mummification of, 3⁹⁹
 papraceous 461
 physiology of, 23
 position of 60
 presentation of 59 *et seq*
 Follicles Graafian, 14

- Gonorrhoea in pregnancy, 220 22
Graafian follicles, 14
 fertilisation in, 320
Granuloma inguinale in pregnancy, 222 3
Greenhay, 718
Gwathney's method of analgesia, 794
- Hæmatological examination, methods of, 239 41
Hæmatometra, 43
Hæmophilia, blood transfusion in, 784 5
Hæmorrhage accidental, Cæsarean section in, 700
 and shock, blood transfusion in, 784
 complications in, 360 1
 in abortion, 318
 in new born, 149 50
 in pregnancy and labour, 348 *et seq*
 indications for Cæsarean section, 359 61
 induction of labour in, 737
 mistaken for acute hydrops, 284
 postpartum 579 *et seq*
 secondary, complicating rupture of uterus, 619
 severe or fulminant type of, 359
Hall, Marshall, method of artificial respiration of, 624
Harelip, 636
Head of new born child, injuries to, 628 31
Heart disease and marriage, 206
 and pregnancy, 196 7
 hypertrophy of, during pregnancy, 30
 muscle in eclampsia, 169
Hebosteotomy, 557
Hegar's dilators 316, 740
 sign, 36, 37, 41, 42, 330
Helminthiasis in pregnancy, 233 7
Hemiplegia, 801 2
Hernia, amniotic 635 6
 into the umbilical cord, 635 6
Higginson's syringe, 372
Hilum of ovary, 14
Hoffman, 168
Hookworm disease *See Helminthiasis*
Hour glass spasm of uterus, 479 81 *See also Uterus*
Hydatidiform mole, 49 274 80
 Aschheim Zondek Test in diagnosis of, 54
Hydrannios, 49
 acute in differential diagnosis of abruptio placenta, 353
 associated with anencephalus, 298
 complications in, 285
 hæmorrhage mistaken for, 284
 hydatidiform mole mistaken for, 278
 in pregnancy, 282 7
 in prolapse of the cord, 449
 induction of labour in, 737
 X ray examination in 55
Hydrocele and inguinal hernia, 637
Hydrocephalus 238 300
Hydrothorax, 300
Hymen, 10
Hyperemesis gravidarum 31, 34, 73, 152 9
 treatment of, 155
Hypothyroidism in pregnancy, 261
Hysterectomy, Cæsarean, 519, 559, 713 15
Hysterotomy abdominal 733 4
 vaginal, 733
- Icterus gravis, 146
Icterus neonatorum 145
Incarceration in ovarian cysts 523
Induction of labour in contracted pelvis, 551 4 *See Labour, Induction of*
Infant, changes in circulation after birth 26
 premature, care of 143
Infantile beri beri in pregnancy 232
 convulsions, 146
Infarct formation of placenta 291
Influenza during pregnancy 212 4
Infundibular pregnancy 327 9
Infundibulum of tube 14
Infusion 788 9
Insanity, reproductive 781 3
Insufflation 625
Insulin in treatment of hyperemesis 157
Intercrural diameter of pelvis 2
Internal os, 11
Interspinous diameter of pelvis 2
Interstitial portion of tube 14
Inter trochanteric diameter of pelvis 2
Intestinal obstruction in pregnancy 233
 toxins absorption of causing eclampsia 167
Intrapertoneal rupture in ampullary pregnancy 327
 in isthmal pregnancy 325
Intra uterine douche in puerperal infection 770
 swab, technique of taking 758 9
Isthmus of tube 14
Isthmus uteri 11
- Jacquemier's sign 35
Jardine, 690
Jaundice, catarrhal in new born 145
 in pregnancy, 160
Jellett, 505
Jellett's classification of contracted pelvis 532 3
- Kahn Test 219 (bis)
Kala azar in pregnancy 226 7
Kidney in eclampsia 169
 in pregnancy, 163
Krause's method of induction of labour, 739
 of terminating pregnancy, 165 186
- Labia majora, 8
 minora, 9
Labour, accessory muscles of 90
 anæsthesia and analgesia in 789 94
 bed, 103
 causes of 85
 complicated by double monsters 302 3
 by ovarian tumours 625 6
 control of hæmorrhage in, 93
 definition of 85
 delivery of the body in 115
 of the shoulders in, 100 114
 descent with increased flexion in vertex presentation, 96

- Labour, dilatation of the cervix in, 88 90
 of the vagina and vulva in, 90
 dystocia in, 377 *et seq*
 fibromyomata complicating, 517 18
 first stage of, 86 90
 management of, 108
 flexion in, 95
 forces concerned in, 94
 hæmorrhages in first two stages of, 348
et seq
 in breech presentation, 412 19
 in uterine malformations, 492 3
 induction of, 735 41
 indications for, 735 9
 medicinal methods of, 740
 methods for 739 41
 internal rotation in vertex presentation, 97
 lacerations during 598 *et seq*
 management of 104
 cardiac patients during 204
 with eclampsia, 184 7
 mechanism of 94 *et seq*
 missed 481 2
 moulding of the head in, 95
 muco sanguinous discharge during, 87
 normal 101 *et seq*
 nourishment in 109
 obstetric examination in, 105
 perineal lacerations in, 110, 117
 precipitate 469 70
 premature 303
 preparation of the patient for, 104
 preparations for, surroundings, 102
 rupture of the membranes in, 90
 artificial 109
 second stage of, 90 1
 management of, 109
 signs and symptoms of, 108
 stages of 86 *et seq*
 test for fibroids complicating pregnancy 519
 the show in 83
 third stage of 91 101
 common mistakes in 118
 complications of, 579 *et seq*
 management of, 117
 tumours complicating 510 *et seq*
 uterine contractions during 87, 90, 91
 vaginal examination in, 105
 repeated 107
 vertex presentation extension and birth
 of foetal head, 98
 external rotation, 99
 restitution in 99
 with transverse lie, 437-48
 Lacerations of cervix during labour, 603 7
 of perineum during labour, 600-4
 of vagina during labour, 604 5
 post natal, 798 9
 Lachapelle, Madame, manœuvre of, 408
 Lactation, 126
 Laminaria tents for dilatation of the
 cervical canal, 733
 Langhans layer of cells, 20, 275
 Laparotomy in ruptured ectopic pregnancy, 319
 Letzke's operation, 538
 Leishmania Donovanii, 226
 Leprosy in pregnancy, 232 3
 Ligament, ovarian 14
 Ligamenta transversalia colla 12
 Ligaments of uterus 12
 round, in pregnancy, 28
 Linea alba, 30, 39
 Linde, 168
 Liquor amnii, 21
 folliculi, 18
 Lithopædion, 329, 336
 Litzmann's classification of contracted
 pelvis, 531
 obliquity, 96, 378, 389 90
 Liver, acute yellow atrophy of, in pregnancy, 159
 changes of, during pregnancy, 31
 in eclampsia, 169
 in hyperemesis gravidarum, 152-3, 155
 Lochia, 125 133 751, 755
 Lochiometra, 132
 treatment of, 771
 Lumbar puncture in eclampsia, 191
 Lungs in eclampsia 169
 tuberculosis of, induction of labour in,
 736 7
 Lymphatic supply of reproductive organs,
 16
 Mackenrodt's ligaments 12
 Madras, Government Hospital for Women
 and Children 172, 274, 348, 361,
 412, 435, 449, 458
 Magnesium sulphate in eclampsia, 191
 Malaria in pregnancy, 223 6
 Martin 537
 Martin's method in breech presentation,
 430
 Maturation of ovum, 19
 Mauriceau Vent method in breech presentation, 431
 Measles in pregnancy, 215 16
 Medulla of ovary, 14
 Medullary plate, 21
 Melena neonatorum, 150
 blood transfusion in, 785
 Membranes examination of, 120
 foetal, 21
 puncture of, in termination of labour,
 165, 186
 retained or adherent, 591
 retention of, 120
 rupture of, before application of forceps
 654
 for induction of labour, 739
 in breech presentations, 423
 in face presentations, 403 6
 in head and hand presentation, 457 8
 in occipito-posterior presentation,
 384
 in transverse presentations 443
 Menopause, premature, as result of
 removal of ovaries, 19
 Menstruation 17
 age at onset 17
 amount of blood lost in, 17
 disturbances associated with, 17
 duration of, 17
 periodicity of, 17
 relation to ovulation, 18

- Menstruation, suspension of, in lactation, 17
 suspension of, in pregnancy, 17
 Mental instability, induction of labour in, 738
 Mesoderm, 20
 Mesovarium, 14
 Metabolism, diseases of, in pregnancy, 259 62
 Metreurynter in placenta previa, 370 2
 in treatment of abruptio placenta, 358
 Metritis, chronic, 43
 Michaelis's rhomboid, 538
 Milk, comparison of cow's and human, 139
 cow's, 140
 human, composition of, etc., 127
 Miscarriage, 303
 Mole, blood, 308
 carneous, 308
 hydatidiform See Hydatidiform Mole
 tuberosa, 309
 vesicular, 311
 Möller, Essen, 375
 Morburg's belt, 585
 Mons veneris, 8
 Monsters, double, 300 3
 ischiopagus, 302
 syncephalic, 301
 thoracopagic, 301
 Montgomery's follicles, 30, 35
 Morning sickness in pregnancy, 31, 33, 34, 73
 Morphine in treatment of eclampsia, 179, 181, 183, 187
 Morula, 20
 Mulberry stage, 20
 Multiple pregnancy, 458 *et seq*
 complications in, 465
 diagnosis of, 462
 labour in, 462 4
 presentations in, 461
 treatment in, 466 8
 Munro Kerr Muller method in induction of labour in contracted pelvis, 79, 553 4
 Murray, Milne, 648
 Muscles, coccygeus, 1
 Levatores ani, 1, 16
 Obturator internus, 1
 Pyloricus, 1
 Musculospiral nerve paralysis, 632 3
 Myomectomy, 518
 Nadelhoffer, 718
 Nägele's obliquity, 96, 378, 387 9
 pelvis, 540, 570 1
 Necator americanus, 234
 Nembutal in labour, 793
 Neoplasms, vaginal, 486
 Nephritis, chronic, induction of labour in, 736
 in pregnancy, 251 3
 occult, 163, 174, 185, 192
 in pregnancy, 252
 Nerves of genital organs, 16
 of new born child, injuries to, 631 3
 Nervous system, diseases of, in pregnancy, 265 6
 in pregnancy, 32
 Neurenteric canal, 21
 New born child, accidents and injuries to, 626 *et seq*
 asphyxia of, 620
 bath of, 137
 bowels of, 136
 care of the, 122 3, 135 6
 care of eyes of, 136
 of umbilical cord, 137
 circulation of, 26
 clothing of, 137
 diseases of, 144 50
 feeding of, artificial, 139 43
 breast, 137
 care of the bottle in, 141
 proprietary foodstuffs in, 142
 fracture of bones in, 633 635
 hæmorrhages in, 149 50
 imperforate anus, 634 5
 injuries to nerves of, 631 3
 micturition of, 137
 surgical affections of, 633 4
 weight of, 137
 wet nursing of, 139
 Nicholson, 168
 Nuchal position, 429
 Nucleus, 19
 Oblique diameters of pelvis, 4
 presentations 434 *et seq*
 Obstetric diagnosis methods of, 66 *et seq*
 outfit, 102
 Obstetrics, endocrine therapy in, 804 5
 endocrinology in, 802 5
 Occipito posterior positions 380 7
 Edema in pre eclamptic toxæmia, 161
 Gstrin, 804
 Oligohydramnios, 48, 49
 in pregnancy, 287
 Ophthalmia, 749, 753, 779 50
 Operations, obstetric, 640 *et seq*
 Ophthalmia neonatorum, 144 5
 Oslander's sign, 35
 Osteomalacia in pregnancy 260 9
 Ostium of Fallopian tube, 14
 Ovarian cyst, rupture of, 523
 twisted in pregnancy, 272
 Ovarian tumours 44
 complicating labour, 521 *et seq*, 525 6
 complicating pregnancy, 521 *et seq*
 cystic, 521 6
 solid, 527
 Ovaries, 14, 801
 arterial blood supply of, 14
 at birth 18
 germinal epithelium of, 18
 internal secretions of, 17
 ligament of, 14
 removal of, before puberty 19
 Ovary, tumours of in differential diagnosis of retroverted gravid uterus, 496 7
 Ovulation, 17
 occurrence of, 18
 relation to menstruation, 18
 Ovum, 18
 death of, 48
 discharge of, from ovary, 19
 diseases and abnormalities of the, 274 *et seq*

- Ovum, diseases of, cause of abruptio
 placenta, 349
 fertilisation of, 19
 implantation of, 322
 maturation of, 19
- Pajot's manoeuvre, 665
- Palate, cleft, 636
- Palpation, abdominal, 66 *et seq*
 perineal, 107
- Pampiniform plexus 15
- Parametritis, 749 752
- Parathyroids, 803
- Parturient canal injuries to, 598 *et seq*
 Pawlik's grip, 68, 397
- Pelvic cavity, enlargement of, 723 *et seq*
 cellulitis, 752 779
 diaphragm 1
 grip, second, 10
 joints relaxation of, in pregnancy, 6,
 28 32
 peritonitis 753
 presentations 411 *et seq*
- Pelvimetry, 107
 external 537 41
 in pregnancy, 79
 internal 541 4
 radiological 58
- Pelvis, anatomy and physiology of, 1
 assimilation 576
 bony, enlargement of, 557 8
 cavity 1, 5
 contracted 530 *et seq* See Contracted
 Pelvis
 diameters of, 2
 difference between male and female, 8
 dwarf, 565 6
 false 1
 flat 540 566
 fractures of 579
 funnel shaped 540 573 4
 generally contracted, 540, 564 5
 flat 566
 inlet of 1
 joints of 6
 measurements of, 2 See also Pelvi-
 metry
 external and internal in pregnancy,
 79
- Nägele's 570 1
 obliquely distorted, 540, 570 2
 obiecta 576
 outlet of, 1, 4
 peritoneum of, 12
 planes of 2
 pseudo malacosteon, 578
 rickety triradiate, 578
 Robert's, 572 3
 scoliotic, 571 2
 split, 578
 spondyloathetic, 574 6
 transversely contracted, 540 572 3
 triradiate, 267
 true 1
 tumours of 579
 types of, 563 4
- Perforation See Craniotomy
- Perimetritis, 749
- Perineum, 10
- Perineum injuries to, in labour, 600
 lacerations of, 110, 117, 795
 protection of, 111
 repair of, 121
 rigid, 483
- Peritoneal relations, 12
- Peritoneum during puerperium, 127
- Peritonitis complicating rupture of uterus,
 619
- Phimosis, 635
- Phlegmasia alba dolens, 750, 780 1
 "Physiological chill," 93
- Pica, 34
- Pituitary extract, 804 5
 injections of, in placenta prævia, 368
 gland, 802 3
- Placenta, 21, 23, 804
 accreta or increta, 292, 591
 adherent, 587, 590 1
 or retained, sequelæ of, 592 3
 anomalies and diseases of, in pregnancy,
 288 96
 "battledore," 200 294
 bipartite (illus.), 289
 diseases of, in pregnancy, 291 2
 examination of, 120
 expression of, 119
 by Credé's method, 119
 expulsion of, 93
 fenestrata, 288
 horse shoe, 288
 in eclampsia, 169
 infarcts of, 291
 lobate, 288
 marginata or circumvallata, 290
 membranacea, 288, 361
- Placenta prævia, 291, 361 *et seq*
 Braxton Hicks' method of bipolar
 version in, 369
 Cesarean section in, 374, 700
 vaginal, 375
 complications in, 365, 376
 diagnosis amniography in, 57
 differential diagnosis from abruptio
 placente 353
 immediate delivery in, 374
 induction of labour in, 737
 metrorrhæyter in, 370 2
 rupture of membranes and injections of
 pituitary extract, 368
 simple rupture of membranes in treat-
 ment of, 367
 treatment of, 366 76
 vaginal tamponage in treatment of, 368
 Willett's forceps in, 372
- Placenta, retained, 587 90
 retention of, 120
 separation of, 92, 117
 succenturiata 289
 syphilis of, 291 2
 tuberculosis of, 291 2
 velamentous insertion of, 294
- Placentæ abruptio 348 *et seq*
- Placental polypus, 592 3
- Placentitis, 231
- Plasmodi trophoblast 20
- Playfair Partridge method of converting
 face into vertex presentation, 407
- Plica 14

- Pneumothorax, artificial, in tuberculosis complicating pregnancy, 209, 210
 Polar body, first and second, 19
 Polypus, fibroid differentiated from chronic puerperal inversion, 595
 placental, 592 3
 Porro's operation, 558
 Portia method of exteriorisation of uterus, 269
 operation, 559, 715 16
 Position Walcher's, 7
 Posterior lobe pituitary extract, 804 5
 Postnatal care, 135, 795 802
 complications in, 798 9
 Postpartum hæmorrhage primary, 579 86
 secondary, 586 7
 postural treatment of cord presentation, 452
 Potter, 678
 Pouch of Douglas, 10, 13
 utero vesical, 13
 Prague method in breech presentation, 430
 Pre eclamptic toxæmia, indications for termination of pregnancy, 160
 blood pressure in, 161
 induction of labour in 736
 Pregnancy, abdominal, 335 46
 abdominal wall in, 28, 45
 palpation and auscultation in, 78
 primary, 321
 secondary, 328 9
 tertiary, 329
 Pregnancy, acute infectious diseases complicating 212
 salpingitis in, 272
 yellow atrophy of the liver in, 159
 advice during 83
 albuminuria of, 160
 amenorrhœa in 33, 46
 ampullary, 326 7
 anæmias in, 238 50
 and future pregnancies, 205
 and heart disease, 196 7
 appendicitis in, 271 2
 Aschheim Zondek Test in, 42, 52
 auscultatory signs in, 39
 bacilluria in 259
 ballottement in, 40
 bath in, 82
 beri beri in, 231 2
 biliary colic in, 273
 blackwater fever in, 227 8
 bladder in, 34
 blood pressure in, 30, 77
 bowels in 82
 breasts in, 30, 35, 82
 cancer complicating 528
 cardiac complications *See* Pregnancy, diseases of the heart and
 cephalometry in 79
 cervix in, 37, 45
 changes in disposition during 34
 chicken pox in, 216
 chokra in 228 30
 chorea gravidarum in, 265 6
 chyluria in, 230
 circulatory system in 30
 clothing in 81
 cornual 330
 Pregnancy, corpus luteum in, 18
 death of foetus during 626 7
 deficiency diseases in, 266 9
 diabetes in 209 61
 diagnosis of, 32 *et seq* 41
 between first and subsequent 45
 pneumo peritoneum, 50
 diagnosis of, radiological 52, 55
 Diagnosis Station, Edinburgh, 54
 diet in, 80
 differential diagnosis of 43 *et seq*
 from ovarian cysts 44
 from uterine fibroids 44
 digestive system in, 31
 diphtheria in 216
 diseases complicating, 193
 of blood in 238 *et seq*
 of the cardiovascular system in 190
 of the gastro intestinal tract in 262 5
 of the heart and 196 204
 of the heart and treatment 199 204
 of metabolism in 239 62
 of the nervous system in 260 6
 of the placenta in, 291 2
 of the respiratory system complicating 206 *et seq*
 of the skin in 270 1
 of the urinary system during 200 3
 diverticulitis in 273 4
 duration of 46
 dysenteries in 262 5
 eclampsia in, 160
 ectopic, 319 *et seq*
 endocrine system in 32
 examination during 74 5
 exercise during 73 81
 extra uterine differential diagnosis from abortion 311
 Fallopian tubes in 28
 filariasis in 230 1
 foetal heart in 39
 frequency of micturition in 32 34
 Friedman's Test in 53
 gonorrhœa in 220 2
 granuloma inguinale in 222 3
 hermatological examination during 76
 hæmorrhages in third trimester of 348 *et seq*
 height of uterus in 77
 helminthiasis 243 7
 hydatidiform mole in 274 80
 hydramnios in 282 7
 hyperemesis in 152 9
 hypertrophy of heart in, 30
 hypothyroidism in 261
 in uterine horn 346
 in uterine malformations 492 3
 infantile beri beri in 232
 influenza during 212 14
 infundibular, 327 9
 interstitial 323 4
 intestinal obstruction in 273
 isthmial 324 6
 jaundice in 159 60
 kala azar in 226 7
 kidney in, 163
 leprosy in, 232 3
 liver changes in 31
 lobar pneumonia in, 210 11

- Pregnancy, longings of, 34
 malaria in, 223 6
 mamma in, 45
 maternal chances due to, 27
 measles in, 215-16
 melancholia in, 32
 mental hygiene during, 82
 morning sickness in, 31, 155
 multiple, 458 *et seq*
 X rays showing, 35
 nephritis in, 251 3
 nervous system in, 32
 obstetric examination during, 77
 oedema in, 31
 oligohydramnios in, 287
 ovarian, 320 1
 palpation of foetal parts, 39
 pelvimetry in, 79
 perforated gastric ulcer in, 273
 pernicious anaemia in, 237, 242 8
 vomiting in, 273
 physiology of, 27
 pigmentation of skin during, 32, 39
 placentitis in, 291
 pre-eclamptic toxæmia of, 163 6
 pyelitis in, 31
 quickening in, 38, 50
 relapsing fever in, 216 18
 relaxation of pelvic joints in, 6
 renal colic in, 273
 respiratory system in, 31
 round ligaments in, 28
 salivation in, 34
 scarlet fever in, 215
 secondary anæmias during, 249 50
 serological tests in, 76
 sexual intercourse during, 82
 signs of, objective and subjective, 33
 et seq
 skeleton in, 32
 skin in, 32, 39
 souffle, funic in, 40
 uterine in, 40
 sprue in, 269 70
 surgical emergencies during, 271 4
 symptoms of, 33 *et seq*
 syphilis in, 218 20
 teeth in, 32, 81
 termination of, in diabetes, 262
 in eclampsia, 184 6
 in hyperemesis, 137 8
 in tuberculosis, 209
 indications for, in pre-eclamptic
 toxæmia, 166
 methods of, 165
 thyrotoxicosis in, 261 2
 toxæmias of, 151 *et seq*
 cause of abruptio placentæ, 349
 concealed accidental hæmorrhage in,
 192
 tubal, 321 3
 tubal gestation in, 272
 tuberculosis complicating labour,
 209 10
 during puerperium, 210
 of lungs during, 206
 tubo uterine, 324
 tumours and, 510 13
 twisted ovarian cyst in, 272
- Pregnancy, typhoid in, 214
 urinary infections in, 253 9
 urinary system during, 31
 urinary tract during, 254
 urine in, 31
 uterus in, 27, 34, 35, 39, 47, 50
 vagina in, 28, 35, 45
 varicosity of veins, 31
 variola in, 214 5
 vascular system in, 30
 vomiting in, 31, 152, 154
 weight in, 77, 162
- Presentation, abnormal, 66, 78
 anterior fontanelle, 377, 379 80
 anterior parietal, 387 9
 breech, 62, 411 *et seq*
 differentiated from face, 397 8
 brow, 61, 378, 390 5
 cephalic, 61, 63, 387 *et seq*
 compound, 62, 453 8
 cord, 449 *et seq*
 elbow, 417
 face, 61, 378, 395-409
 foot, 417
 glabellar, 378, 410 11
 hand, 417
 head and foot, 455, 458
 head and hand, 455, 457-8
 knee, 417
 oblique, 434 *et seq*
 pelvic, 61, 411 *et seq*
 posterior parietal, 389 90
 shoulder, 61, 62
 transverse, 434 *et seq*
 vertex, 61, 65, 377
- Presenting part, engagement or fixation of, 94
- Price-Jones' method of blood examination, 239 40
- Primitive streak, 21
 fold, 21
- Primordial follicles, 18
- Prolapse of umbilical cord with complete presentation, 458
- Prophylactic care, 102
- Proprietary foodstuffs, 142 3
- Pseudoecyosis, 44 5
- Puberty, signs of, 17
- Pubiotomy, 729 30 *See Symphysiotomy*
- Pubis, symphysis, 6
- Pudic artery, internal, 14, 16
- Puerperal ascites, 830 1
- "Puerperal fever," 742
- Puerperal infection, 742 *et seq*
 auto infection, 744-5
 cervix in, 747
 complications in, 776 83
 curettage in, 770 1
 diagnosis of, 755 61
 intra uterine douche in, 770
 pathology, 746-7
 pelvic cellulitis in, 779
 peritonitis in, 776 9
 phlegmasia alba dolens, 750, 780
 pyæmia in, 755
 pyæmic abscesses in, 780
 reproductive insanity in, 781-3
 salpingitis, 748, 753, 779 80
 sapræmia in, 751

- Uterus, retroverted gravid, 48, 495-503
 confused with ruptured ectopic gesta-
 tion, 337 8
 differential diagnosis, 496 7
 rupture of, 607-20
 in differential diagnosis of abruptio
 placentæ, 354
 in labour, 608
 in pregnancy, 607 8
 sepsis complicating, 619
 treatment, 614 20
 sacculaton of, 49
 septus, 491, 493
 subinvolution of, 43, 592, 799
 subseptus, 491, 493
 tonic contraction of, 470 3
 in differential diagnosis of abruptio
 placentæ, 354
 tumours of, 49, 510 *et seq*
 unicornis, 491
 veins of, 15
- Venesection in eclampsia, 191
 Ventrofixation, 505
 Ventrosuspension, 505
 Version, 672 *et seq*
 bipolar or combined, 676 8
 Braxton Hicks', 676 8
 cephalic, 673
 external, 674 6
 internal, 678 83
 podalic, 673
 Vertex presentation, 377
 mechanism of labour in, 94
 Vesicular mole *See also* Hydatidiform
 Mole
 and abortion, 311
 X ray examination of, 56
 Vestibule, 9
 Vomiting in pregnancy, 31, 152, 154
 pernicious, of pregnancy, 273
 Vulva atresia of, 483
 cysts of, 485